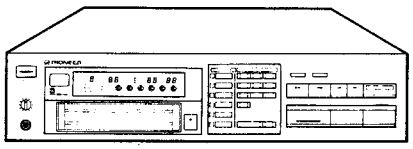
PIONEER®

Service Manual

CIRCUIT DESCRIPTIONS
REPAIR & ADJUSTMENTS



ORDER NO.
ARP1263-A

MULTI-PLAY COMPACT DISC PLAYER

PD-M60

MODEL PD-M60 COMES IN SEVEN VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Power requirement	Destination
KU	AC120V only	U.S.A.
KC	AC120V only	Canada
HEM	AC220V, 240V (switchable)	European continent
HB	AC220V, 240V (switchable)	United Kingdom
SD	AC110V, 120-127V, 220V, 240V (switchable)	General market
SD/G	AC110V, 120-127V, 220V, 240V (switchable)	U.S. Military
HP	AC220V, 240V (switchable)	Australia

- **This service manual is applicable to the KU type.**
- **As to the HEM, HB, HP, SD and SD/G types, please refer to the additional service manual (ARP1264).**
- **As to the KC type, please refer to the additional service manual (ARP1272).**
- **Ce manuel d'instruction se refere au mode de réglage en francais.**
- **Este manual de servicio trata del método ajuste escrîto en español.**

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1. SAFETY INFORMATION

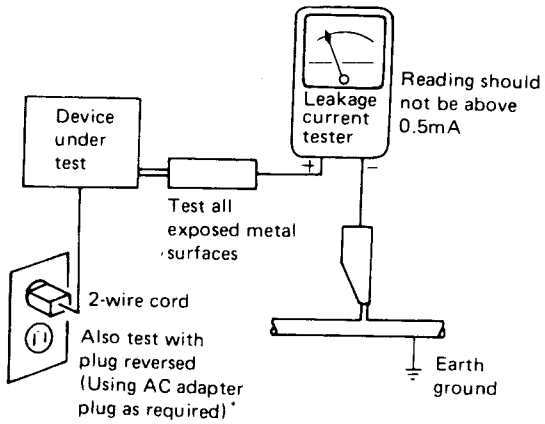
(FOR USA MODEL ONLY)

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.


Leakage current tester
Reading should not be above 0.5mA
Device under test
Test all exposed metal surfaces
2-wire cord
Also test with plug reversed (Using AC adapter plug as required)
Earth ground

AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚠ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, the PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

(FOR EUROPEAN MODEL ONLY)

VAROITUS!

LAITE SISÄLTÄÄ LASERDIODIN, JOKA LÄHETTÄÄ NÄKYMÄTÖNTÄ, SILMILLE VAARALLISTA INFRAPUNASÄTEILYÄ LAITTEEN SISÄLLÄ ON LASERDIODIN LÄHEISYYDESSÄ KUVAN 1. MUKAINEN VAROITUSMERKKI.

LASER
Kuva 1
Lasersateilyn varoitusmerkki

WARNING!

DEVICE INCLUDES LASER DIODE WHICH EMITS INVISIBLE INFRARED RADIATION WHICH IS DANGEROUS TO EYES. THERE IS A WARNING SIGN ACCORDING TO PICTURE 1 INSIDE THE DEVICE CLOSE TO THE LASER DIODE.

LASER
Picture 1
Warning sign for laser radiation

ADVERSEL:

USYNLIG LASERSTRÅLING VED ÅBNING NÅR SIKKERHEDSAFBRYDERE ER UDE AF FUNKTION UNDGÅ UDSAETTELSE FOR STRÅLING.

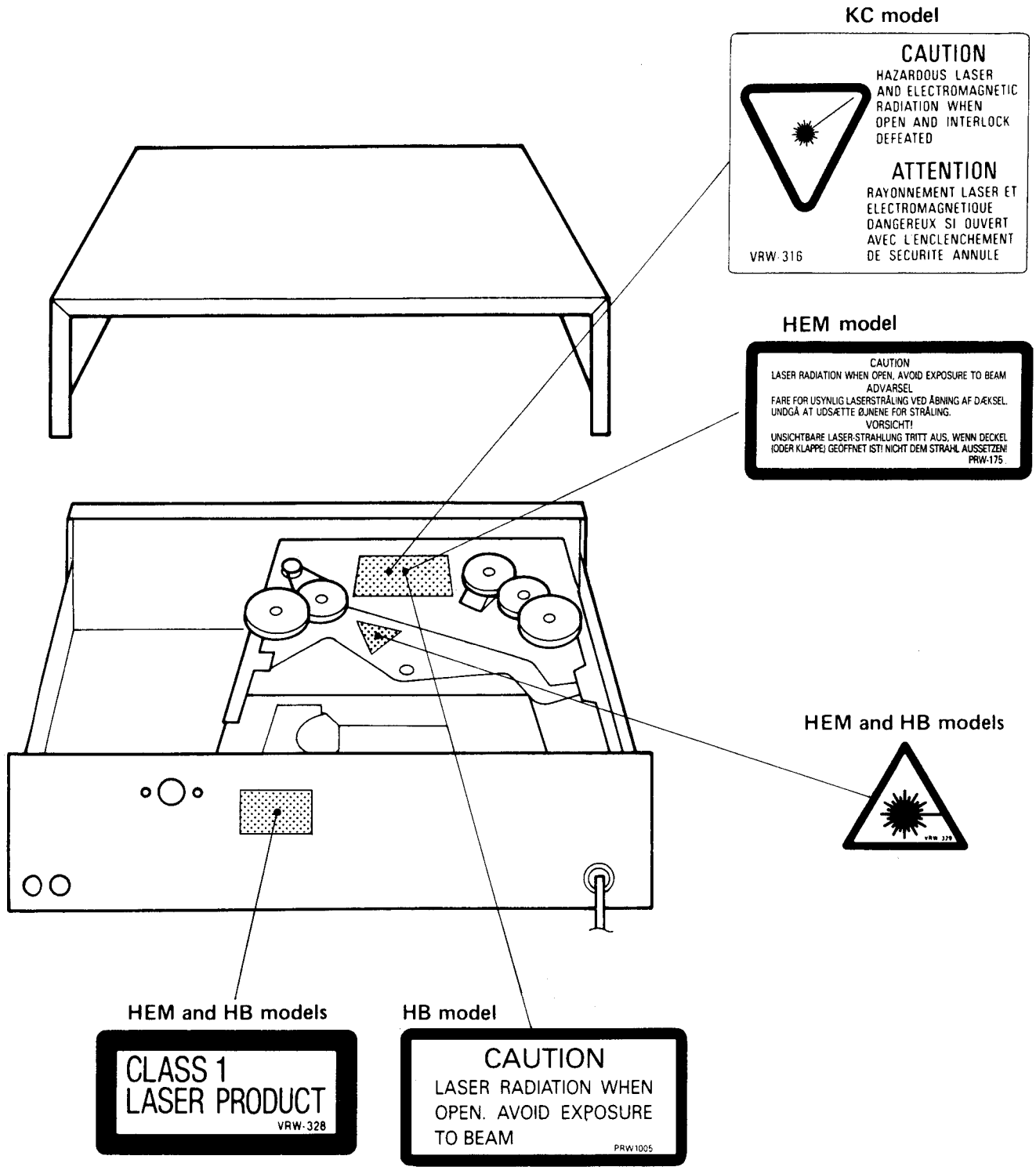
IMPORTANT

PIONEER COMPACT DISC PLAYER APPARATUS CONTAINS LASER OF HIGHER CLASS THAN 1. SERVICING OPERATION OF THE APPARATUS SHOULD BE DONE BY A SPECIALLY INSTRUCTED PERSON.

VIKTIGT

APARATEN INNEHÅLLER LASER AV HÖGRE KLASS ÄN 1. INGREPP I APPARATEN BÖR GÖRAS AV SPECIELLT UTBILDAD PERSONAL.

LABEL CHECK


KC model
CAUTION
HAZARDOUS LASER AND ELECTROMAGNETIC RADIATION WHEN OPEN AND INTERLOCK DEFEATED
ATTENTION
RAYONNEMENT LASER ET ELECTROMAGNETIQUE DANGEREUX SI OUVERT AVEC L'ENCLENCHEMENT DE SECURITE ANNULE
VRW-316
HEM model
CAUTION
LASER RADIATION WHEN OPEN. AVOID EXPOSURE TO BEAM
ADVARSEL
FARE FOR USYNLIG LASERSTRÅLING VED ÅBNING AF DÆKSEL. UNDGÅ AT UDSÆTTE ØJNENE FOR STRÅLING.
VORSICHT!
UNSICHTBARE LASER-STRAHLUNG TRITT AUS, WENN DECKEL (ODER KLAPPE) GEÖFFNET IST! NICHT DEM STRAHL AUSSETZEN!
PRW-175
HEM and HB models
HEM and HB models
CLASS 1
LASER PRODUCT
VRW-328
HB model
CAUTION
LASER RADIATION WHEN OPEN. AVOID EXPOSURE TO BEAM
PRW1005

2. EXPLODED VIEWS

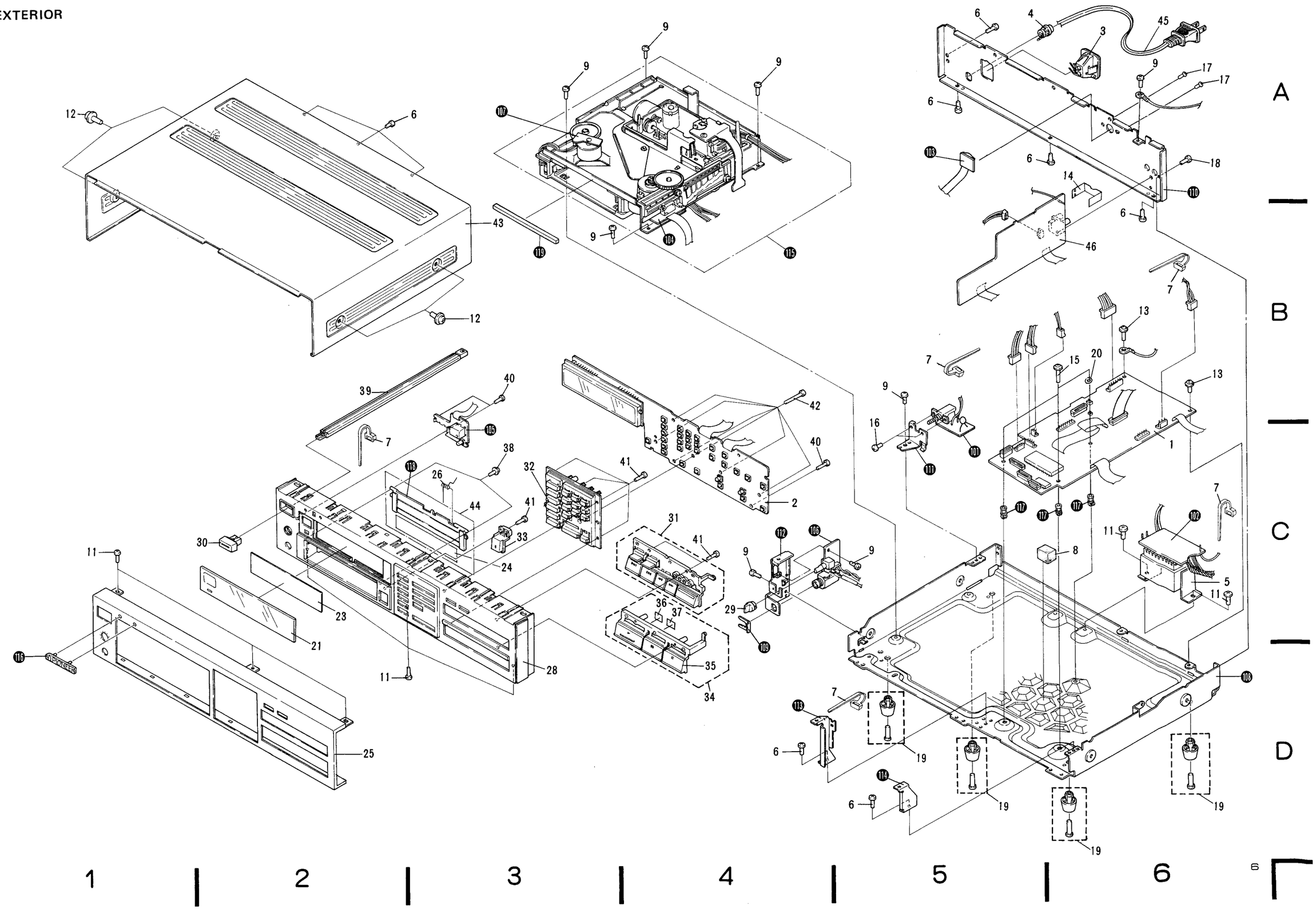
NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification should be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by " ⊙ " are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

2.1 Parts List of Exterior

Mark	No.	Part No.	Description
⚠	1	PWZ1051	Main board assembly
	2	PWZ1053	Control board assembly
⚠	3	AKP-507	AC Socket (AC OUTLET)
⚠	4	CM-22C	Strain relief
⚠ ★	5	PTT1004	Power transformer(AC120V)
	6	BBZ30P060FZK	Screw
	7	PEC-107	Binder
	8	PNM1003	Cushion
	9	BBZ30P060FCC	Screw
	10	BBZ40P080FCC	Screw
	11	BBZ30P080FZK	Screw
	12	FBT40P080FZK	Screw
	13	IBZ30P060FCC	Screw
	14	PBK1001	GND plate
	15	IBZ30P150FCU	Screw
	16	PMZ30P060FCU	Screw
	17	PPZ26P060FZK	Screw
	18	PPZ30P080FZK	Screw
	19	REC-369	Leg assembly
	20	WA30W100R100	Washer
	21	PAM1019	Display window
	22	.....	.....
	23	PAM1021	FL filter
	24	PAM1022	Door plate
	25	PAN1021	Front panel
	26	PBH-456	Door spring
	27	.....	.....
	28	PNW1043	Control panel
	29	PAC-266	Headphone knob (PHONES LEVEL)
	30	PAC-321	Power button (POWER)
	31	PAC1039	Search button
	32	PAC1040	DT button
	33	PAC1041	Eject button assembly
	34	PAD1006	Function button assembly
	35	PAC1038	Function button (PLAY, PAUSE, STOP)
	36	PNY-599	Play lens
	37	PNY-600	Pause lens
	38	IPZ30P060FZK	Screw
	39	PNY-528	Power SW joint
	40	PPZ30P080FMC	Screw
	41	PPZ30P100FMC	Screw
	42	PPZ30P220FMC	Screw
	43	PNA1027	Bonnet
	44	PYY1019	Door assembly
⚠	45	PDG1002 (PDG1015)	AC Power cord
	46	PWZ1052	Audio board assembly
	101		Power switch board assembly
	102		Transformer board assembly
	103		Subcode board assembly
	104		Select board assembly
	105		Remote control board assembly
	106		Headphone board assembly
	107		Loading board assembly
	108		Base
	109		Mount plate
	110		Rear Panel
	111		Switch angle
	112		Front angle(A)
	113		Front angle(B)
	114		Front angle(C)
	115		Mechanism assembly
	116		Friction plate
	117		P.C.B Spacer
	118		Door
	119		Rubber sheet

EXTERIOR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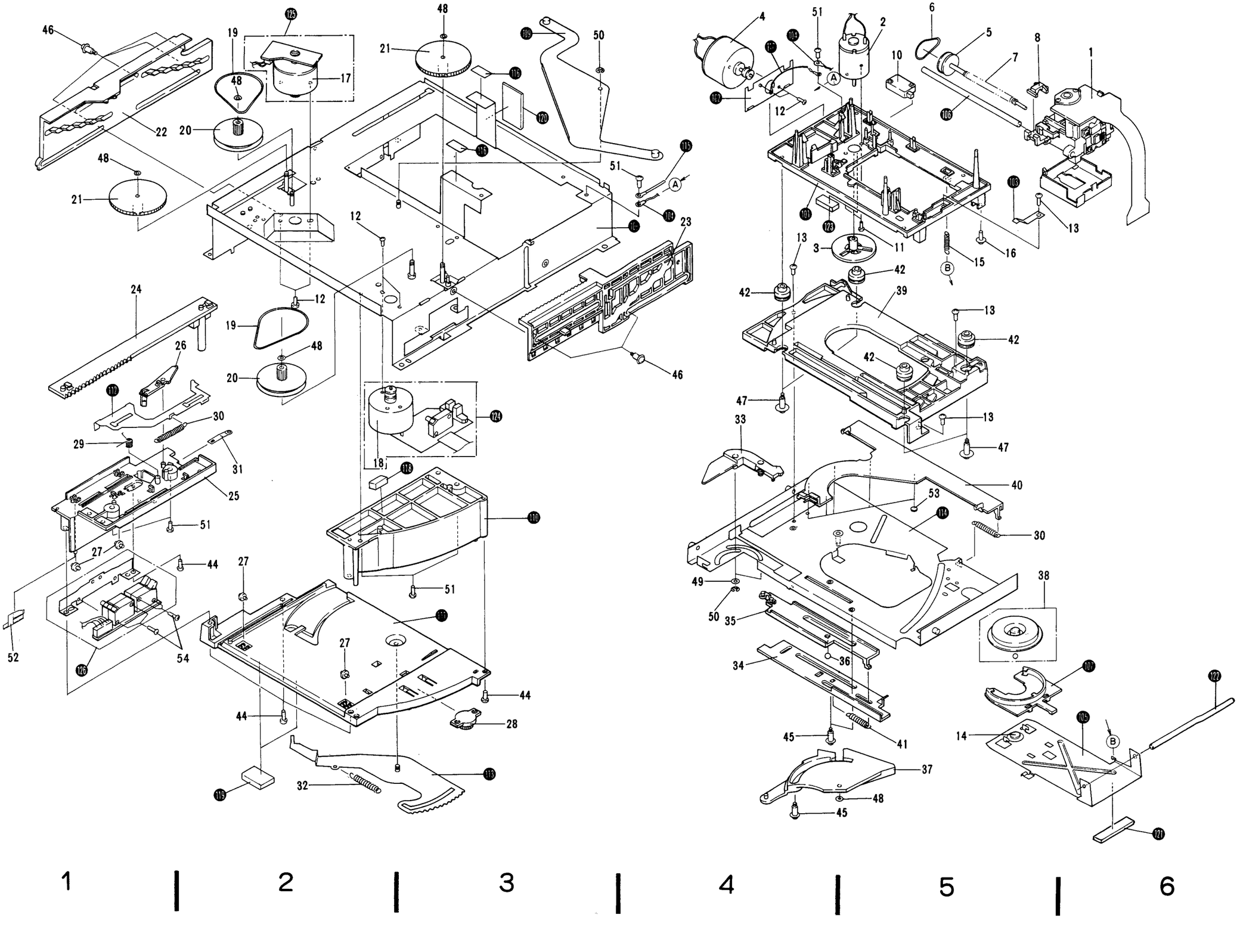
2.2 MECHANISM ASSEMBLY



Parts List of Mechanism Assembly

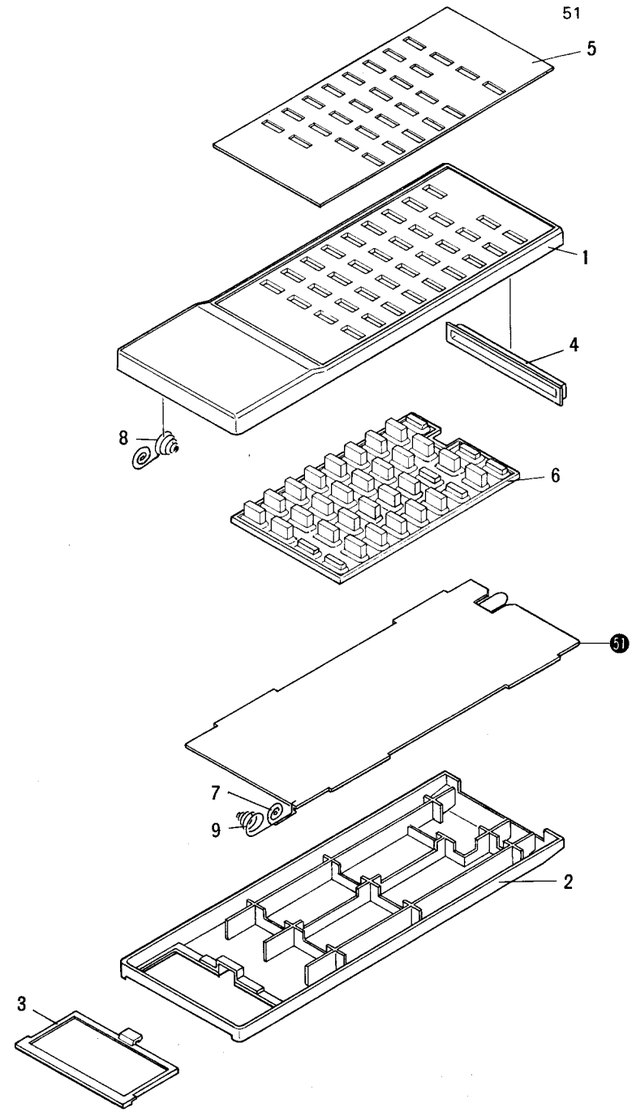
Mark	No.	Part No.	Description
	1	PWY-006	Pickup assembly
★★	2	PXM-147	Spindle motor
	3	PNY-272	Disc table
★★	4	PYY-504	Motor assembly (CARRIAGE)
	5	PNY-499	Pulley
★★	6	PEB-314	Belt
	7	PLB-282	Driver screw
	8	PNY-500	Nut
	9	. . . . .	. . . . .
★★	10	PSH-007	Slide switch
	11	PMZ20P030FMC	Screw
	12	PMZ26P040FMC	Screw
	13	BBZ30P060FMC	Screw
	14	VNL-268	Receptacle
	15	PBH-436	Clamper spring
	16	IPZ30P080FMC	Screw
★★	17	PYY-508	Motor assembly (LOADING)
★★	18	PYY-507	Motor assembly (DISC SELECT)
★★	19	PEB-315	Belt
	20	PNY-379	Gear
	21	PNY-501	Gear
	22	PNY-502	Stair (L)
	23	PNY-503	Stair (R)
	24	PNY-504	Rack
	25	PNY-505	Side guide (L)
	26	PNY-585	Lock lever
	27	PNY-386	Roller
	28	PXC-016	Damper assembly
	29	PBH-437	Twist spring
	30	PBH-438	Multi spring
	31	PBK-087	Press spring
	32	PBH-465	Eject spring
	33	PNY-509	Lever
	34	PNY-510	Differential lever
	35	PNY-511	Drive lever
	36	PBP-001	Steel ball
	37	PNY-512	Swing lever
	38	PNY-646	Clamper
	39	PNY-514	Disc guide
	40	PNY-515	Upper tray

Mark	No.	Part No.	Description
	41	PBH-466	Spring
	42	PEB-316	Float rubber
	43	BBZ30P060FZK	Screw
	44	PPZ30P100FMC	Screw
	45	PBA-112	Screw
	46	PBB-125	Screw
	47	PBA-188	Screw
	48	WT25D047D025	Washer
	49	WA31D054D025	Washer
	50	YE25F	Washer
	51	BBZ30P060FCC	Screw
	52	PBK-101	Side spring
	53	PED-049	Cushion
	54	PMZ26P150FMC	Screw
	101		Mechanism chassis
	102		Motor base
	103		Guide bar retainer
	104		GND lead unit
	105		Clamper holder
	106		Guide bar
	107		Clamper guide
	108		Main chassis
	109		Lever
	110		Side guide R
	111		Bottom guide
	112		SM select
	113		Eject lever
	114		Sub chassis
	115		Cord retainer
	116		Felt
	117		Armor lead unit
	118		BS spacer
	119		Sheet
	120		LPF damper
	121		LPF damper
	122		Holder axis
	123		Magnet
	124		Select board assembly
	125		Loading board assembly
	126		Switch board assembly

2.3 REMOTE CONTROL UNIT (PWW1005)

Parts List of Remote Control Unit

Mark	No.	Part No.	Description
	1	PNW1117	Case(A)
	2	PNW1118	Case(B)
	3	PNW1119	Cover
	4	PAM1047	Filter
	5	PAN1030	Aluminium plate
	6	PEB1017	Rubber sheet
	7	PBK1014	Terminal(A)
	8	PBK1015	Terminal(B)
	9	PBH1019	Spring
	51		P.C. board



:cription

e(A)
e(B)
er
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minium plate

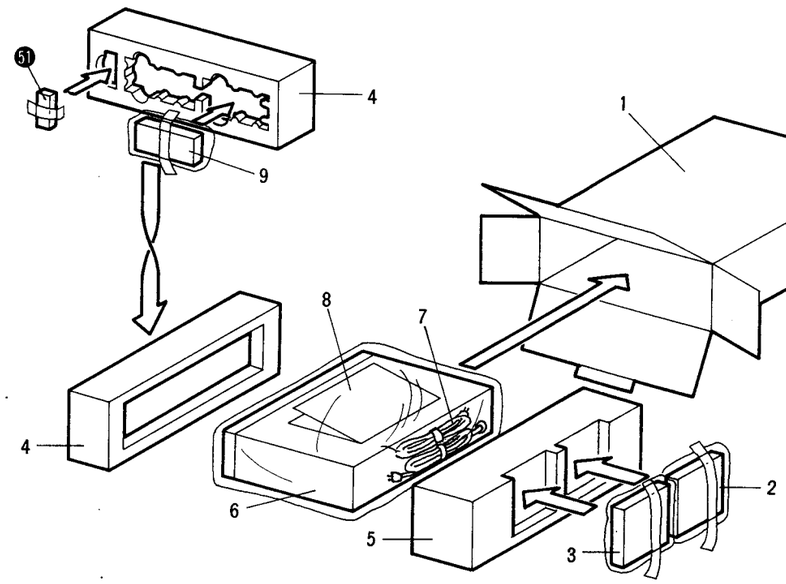
ber sheet
minal(A)
minal(B)
ng

board

3. PACKING

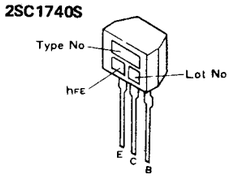
Parts List of Packing

Mark	No.	Part No.	Description
	1	PHG1027	CD Packing case
	2	PXC-027	Magazine assembly
	3	PXC-028	Single magazine assembly
	4	PHA1009	Protecter(F)
	5	PHA1010	Protecter(R)
	6	Z23-007	Mat sheet
	7	PDE1001	Connection cord with pin plug
	8	PRB1009	Operating instruction
	9	PWW1005	Remote control unit
	51		Battery (SUM-3)



External Appearance of Transistors and ICs

2SA933S
2SC1740S



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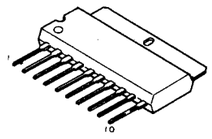

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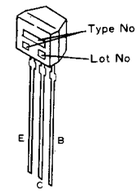

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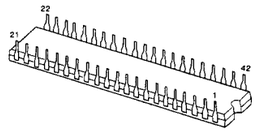

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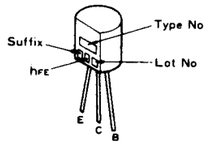

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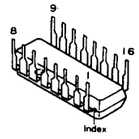

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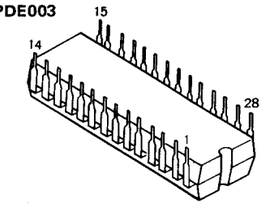

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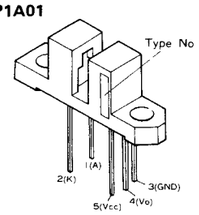

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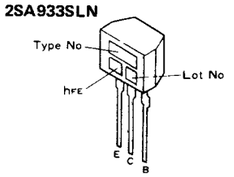

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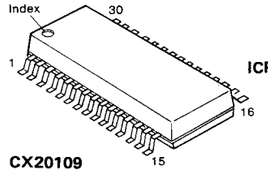

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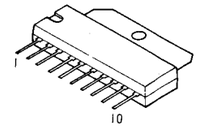

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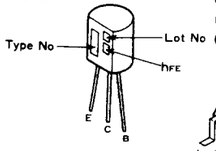

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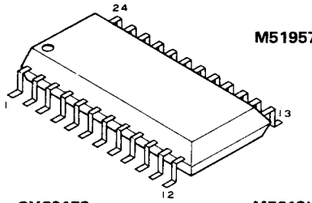
CXK5816M-15L



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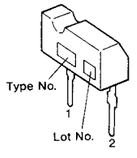

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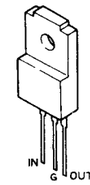

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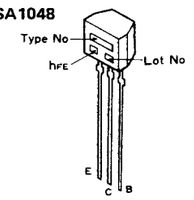
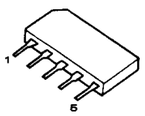


M51957AL



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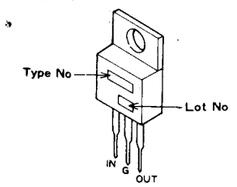
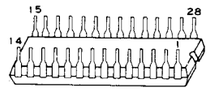


CX20152



M5218L
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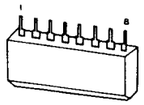

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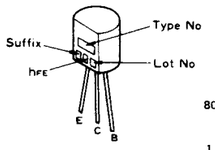

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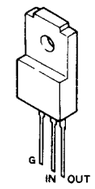

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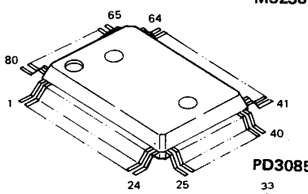

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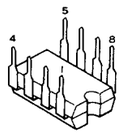
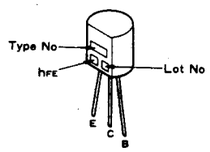
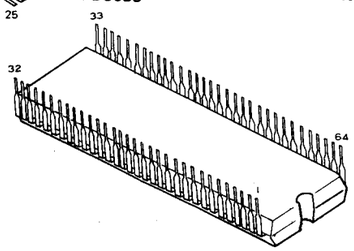


2SK152



PD3085



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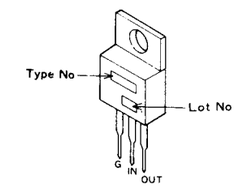
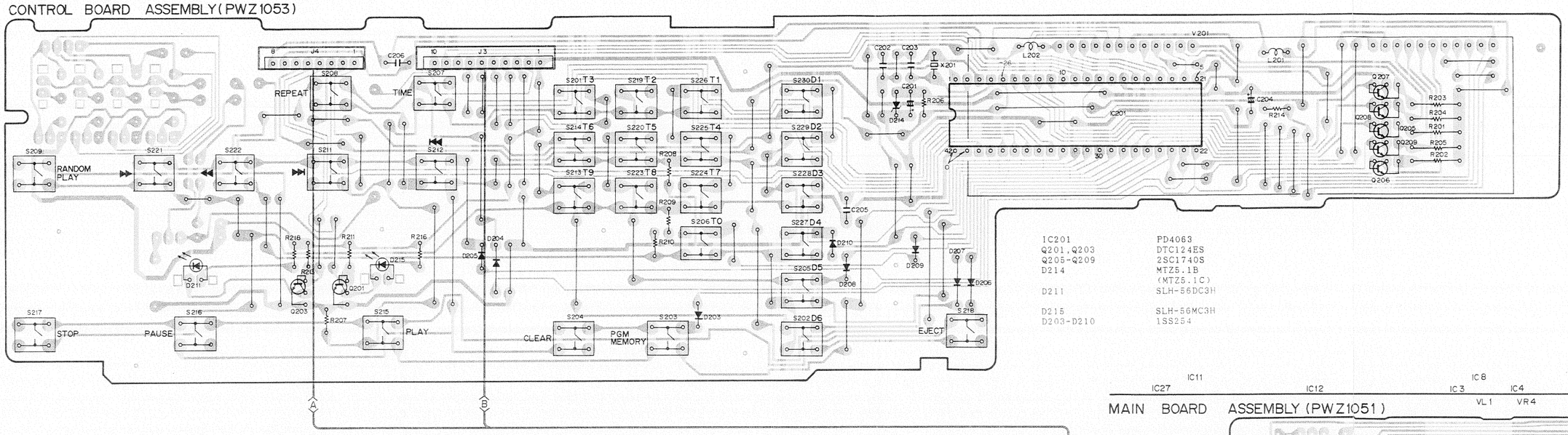


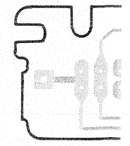
4. P.C. BOARDS CONNECTION DIAGRAM AND SCHEMATIC DIAGRAM

4.1 P.C. BOARDS CONNECTION DIAGRAM

CONTROL BOARD ASSEMBLY(PWZ1053)

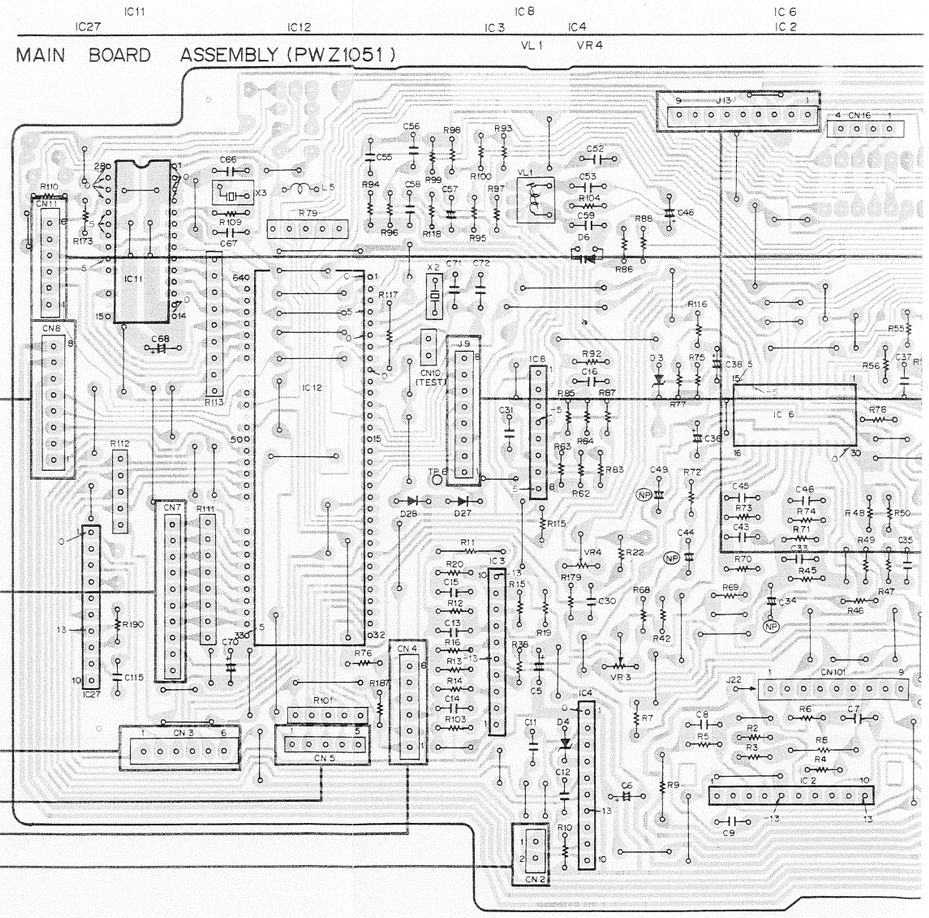


REMOTE CONTROL ASSEMBLY



Q204 DTA
D212 SLH

MAIN BOARD ASSEMBLY (PWZ1051)



PICKUP ASSEMBLY(PWY-006)

MECHANISM SECTION

SWITCH BOARD ASSEMBLY

SELECT BOARD ASSEMBLY

LOADING BOARD ASSEMBLY

REMOTE CONTROL BOARD ASSEMBLY

SUBCODE BOARD ASSEMBLY

HEADPHONE BOARD ASSEMBLY

AUDIO BOARD ASSEMBLY (PWZ1052)

POWER SWITCH BOARD ASSEMBLY

TRANSFORMER BOARD ASSEMBLY

Q204 D212	DTA124ES SLH-56VC3H
IC15	CX20152
IC17,C18	M5238PF
IC19	BU4053B
Q17,Q18	2SD1302
Q12	2SA933SLN (2SA933LN)
Q13,Q14	2SK152
D7,D8,D25,D26	HZ6A1L (HZ6A2L)
IC21	AN78L12
IC20	AN79L12
IC9	CXD1135Q
IC10	CXK5816M-12L (CXK5816M-15L)
IC6	CX20108
IC4,IC27	BA6109
IC5	CX20109
IC24,IC25	ICP-F15
IC23	M5F78M05
IC22	M5F79M05
IC32	M51957AL
IC8	M5238LF
IC11	PDE003
IC12	PD3085
IC2,IC3	TA7256P
Q22	DTC124ES
Q23	2SA1048 (2SA1015)
Q21	2SA933S
D6	KV1225YBR (KV1226YBR)
D4	MTZ11C
D23	RD27EB2 (RD27EB3)
D13-D22	S5566B
D27,D28	1SS254
D3,D24	MTZ5.1B (MTZ5.1C)

AC OUTLET (UN SWITCHED) AKP-507

AC POWER CORD PDG1002(PDG1015)

AC120V 60Hz

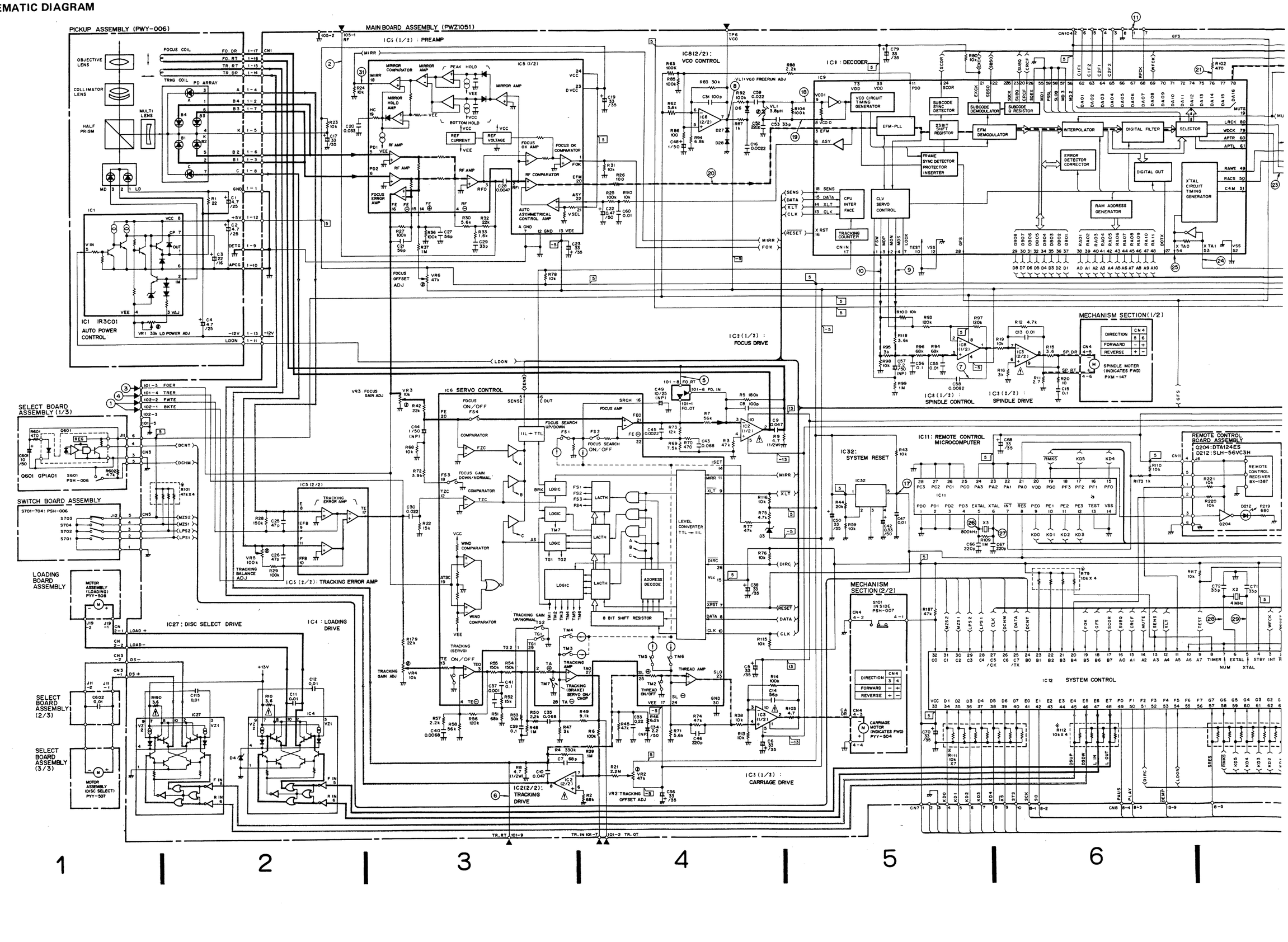
T1 POWER TRANSFORMER PTT1004

PKC-027

6 7 8 9 10 11 12

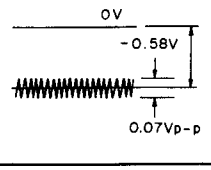
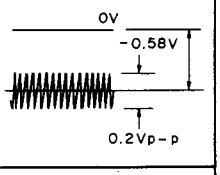
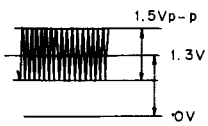
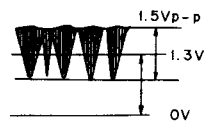
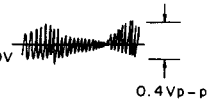
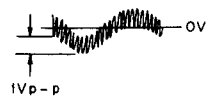
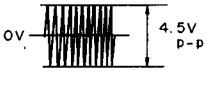
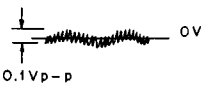
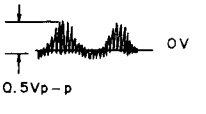
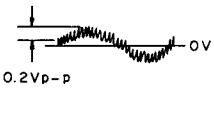
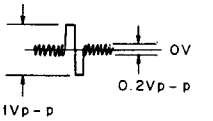
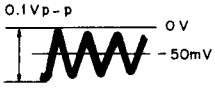
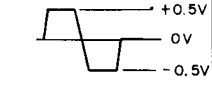
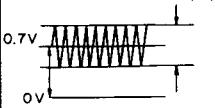
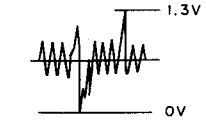
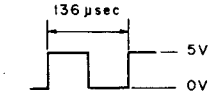
A B C D

SCHEMATIC DIAGRAM



• Wave Forms

Note: The waveform voltage and time values are general guides only.

	PLAY	SEARCH
①		
②		
③		
④		
⑤		
⑥		
⑦		
⑧		
⑨		

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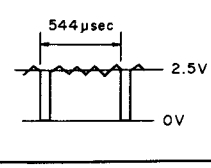
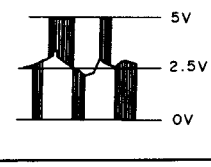
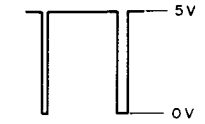
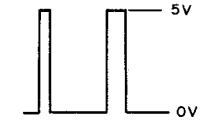
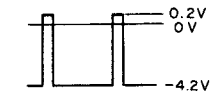
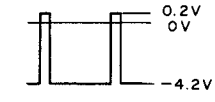
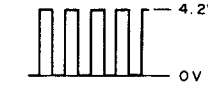
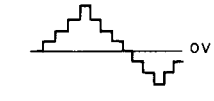
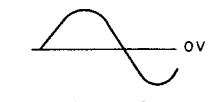
⑩		
⑪		
⑫		
⑬		
⑭		
⑮		

4.2 SCHEMATIC DIAGRAM

NOTE:

1. RESISTORS.
   Indicated in Ω, ¼W, ⅛ W,±5% tolerance unless otherwise noted k; kΩ, M; MΩ, (F); ±1%, (G); ±2%, (K); ±10%, (M); ±20% tolerance

2. CAPACITORS:
   Indicated in capacity (μF)/voltage (V) unless otherwise noted p; pF. Indication without voltage is 50V except electrolytic capacitor.

3. VOLTAGE
   ⌐¬; DC voltage (V) at no input signal

4. OTHERS:
   ➡ ; Signal route.
   ⊘ ; Adjusting point.
   The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
   ※ marked capacitors and resistors have parts numbers.

SWITCHES:

OUTSIDE OF P. C. BOARD ASSEMBLY
S101 : INSIDE ON – OFF

FUNCTION BOARD ASSEMBLY
S201 : 3 (TRACK No.)
S202 : 6 (DISC No.)
S203 : PGM MEMORY
S204 : CLEAR
S205 : 5 (D. No.)
S206 : 0 (T. No.)
S207 : TIME
S208 : REPEAT
S209 : RANDOM PLAY
S211 : TRACK SEARCH (▶▶|)
S212 : TRACK SEARCH (|◀◀)
S213 : 9 (T. No.)
S214 : 6 (T. No.)
S215 : PLAY
S216 : PAUSE
S217 : STOP
S218 : EJECT
S219 : 2 (T. No.)
S220 : 5 (T. No.)
S221 : MANUAL SEARCH (▶▶)
S222 : MANUAL SEARCH (◀◀)
S223 : 8(T.No.)
S224 : 7(T.No.)
S225 : 4(T.No.)
S226 : 1(T.No.)
S227 : 4(D.No.)
S228 : 3(D.No.)
S229 : 2(D.No.)
S230 : 1(D.No.)

POWER SWITCH BOARD ASSEMBLY
S401 : POWER ON - OFF

SELECT BOARD ASSEMBLY
S601 : DISC SELECTOR ON - OFF
(HOME POSITION SW) (HOME POSITION – OUTSIDE OF HOME POSITION)

MECHANISM BOARD ASSEMBLY
S701 (LPS 1) : } LOAD POSITION SW
S702 (LPS 2) : }

	STOP	During the loading	Clamp condition PLAY	during the eject
S701	ON (H)	OFF (L)	OFF (L)	ON (H)
S702	ON (H)	ON (H)	OFF (L)	OFF (L)

S703 (MZS 2) : } MAGAZINE DISCRIMINATE SW
S704 (MZS 1) : }

	NO MAGAZINE	SIX MAGAZINE	SINGLE
S703	ON (H)	OFF (L)	OFF (L)
S704	OFF (L)	ON (H)	OFF (L)

The underlined indicates the switch position.

Focus servo loop line
Signal route
Tracking servo loop line
Carriage servo line
Loading motor route
Spindle motor route
Disc select motor route
► Measurement point

NOTE:
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.

Main Board Assembly

IC21	AN78L12	IC22	M5F79M05	D4	MTZ11C	C135,C136	PCH1043
IC20	AN79L12	IC32	M51957AL	D23	RD27EB2	R79, R112	RA4S103J
IC9	CXD1135Q	IC8	M5238LF		(RD27EB3)	R101	RA4S472J
IC10	CXK5816M-12L	IC11	PDE003	D13-D22	S5566B	R111	RA7S103J
	(CXK5816M-15L)	IC12	PD3085	D27,D28	1SS254	R113	RA8S103J
				D3,D24	MTZ5.1B		
IC6	CX20108	IC2,IC3	TA7256P		(MTZ5.1C)	VR3,VR4	VRTB6VS103
IC4,IC27	BA6109	Q22	DTC124ES			VR5	VRTB6VS104
IC5	CX20109	Q23	2SA1048	L4-L6	LRA010K	VR2,VR6	VRTB6VS473
IC24,IC25	ICP-F15		(2SA1015)	VL1	PTL-031	X2	KBR-4.0MS
IC23	M5F78M05	Q21	2SA933S	133,C134	PCH1037	X3	KBR-800H
		D6	KV1225YBR	C127,C128	PCH1041		
			(KV1226YBR)	C129,C130	PCH1042		

Audio Board Assembly

IC15	CX20152	Q13,Q14	2SK152	
IC17,C18	M5238PF	D7,D8,D25,D26	HZ6A1L	
IC19	BU4053B	F1,F2	(HZ6A2L)	
Q17,Q18	2SD1302	L1	PTF1005	
Q12	2SA933SLN	X4	PTL-022	
	(2SA933LN)	JA1	PSS-009	
			VKB-006	

IC301 M5218L
VR301 PCS-030
JA301 PKN1001

SUBCODE BOARD ASSEMBLY
JA501 PKP-038
SUBCODE OUT
J501
J5
SCOR
MUTE
WFCK
SBSO
EXCK

HEADPHONE BOARD ASSEMBLY
PHONES LEVEL
VR301 20k (1/2)
VR301: PCS-030
IC301 (1/2)
IC301: HEADPHONE AMP
JA301 PHONES

AUDIO BOARD ASSEMBLY (PWZ1052)

IC10 : RAM

DIGITAL FILTER
SELECTOR
DIGITAL OUT
X'TAL CIRCUIT TIMING GENERATOR
ADDRESS GENERATOR
X TAI 53
X TAO 54
VSS 52
MUTE
LRCK 80
WDCK 79
APTR 60
APTL 61
RAWE 49
RACS 50
C4M 51

IC15 D/A CONVERTOR
DGND 13
LRCK
SCLK
WCLK
BCLK
DIN
LATCH D-TYPE LATCH
SCLK OUTPUT
TTL-ECL INTERFACE
TIMING GENERATOR
UPPER 8BIT SHIFT RESISTOR LATCH COUNTER
LOWER 8BIT SHIFT RESISTOR LATCH COUNTER
DISCHARGE DRIVE (L)
CONSTANT CURRENT Io : Io = 2^8 : 1
DISCHARGE DRIVE (R)
CLOCK BUFFER
DCL 23
AGND 21
AVEE 20
IOUT 18
IOUT 17
ISET 16
DCR 15
DGND 22
DVEE SUB DVEE
CIN 26
CIN 27
COUT 25

Q13,14 : I/V AMP
IC17 (1/2)
IC18 (1/2)
IC19 : DEGRIDGE
IC17,18 : SAMPLE & HOLD
F1,F2:LOW-PASS FILTER
5TH LPF
Q17,18 : LINE MUTING
Q12 : SWITCH
AUDIO OUTPUT

REMOTE CONTROL BOARD ASSEMBLY
Q204:DTA124ES
D212:SLH-56VC3H
REMOTE CONTROL RECEIVER BX-1387

Q21,22 : LINE MUTING

IC20-23: REGULATOR
IC24,25: IC PROTECTOR

TRANSFORMER BOARD ASSEMBLY
T1 POWER TRANSFORMER PTT1004
C401 RCG-009 (VCG-004)
POWER SWITCH BOARD ASSEMBLY
S401 POWER SW PSA-009
AC POWER CORD PDG1002(PDG1015)
AC 120V 60Hz
AC OUTLET (UNSWITCHED) AKP-507

Q23 : REGULATOR

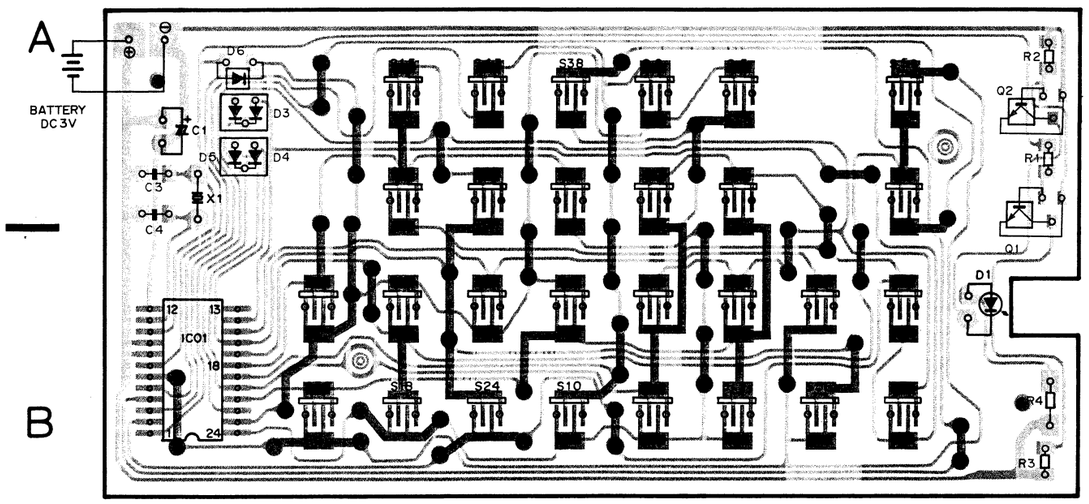
CONTROL BOARD ASSEMBLY (PWZ1053)

IC201	PD4063	D215	SLH-56MC3H	
Q201,Q203	DTC124ES	D203-D210	1SS254	
Q205-Q209	2SC1740S	S201-S209,	PSG-064	
D214	(MTZ5.1B)	S211-S230		
	(MTZ5.1C)	L201,L202	LRA010K	
D211	SLH-56DC3H			
		V201	PEL1002	
		X201	RSS-034	

Q201,203 : LED DRIVE
Q208,209 : DRIVER
IC201 : FL CONTROL
Q205-207: DRIVER

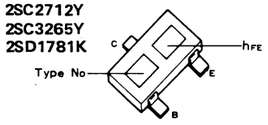
4.3 REMOTE CONTROL UNIT

P.C. BOARD PATTERN

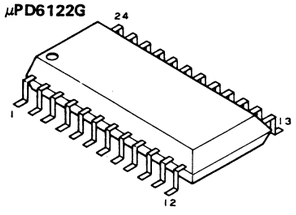


External Appearance of Transistors and ICs.

2SC2411K
2SC2412K
2SC2712Y
2SC3265Y
2SD1781K



μPD6102G
μPD6122G



SCHEMATIC DIAGRAM

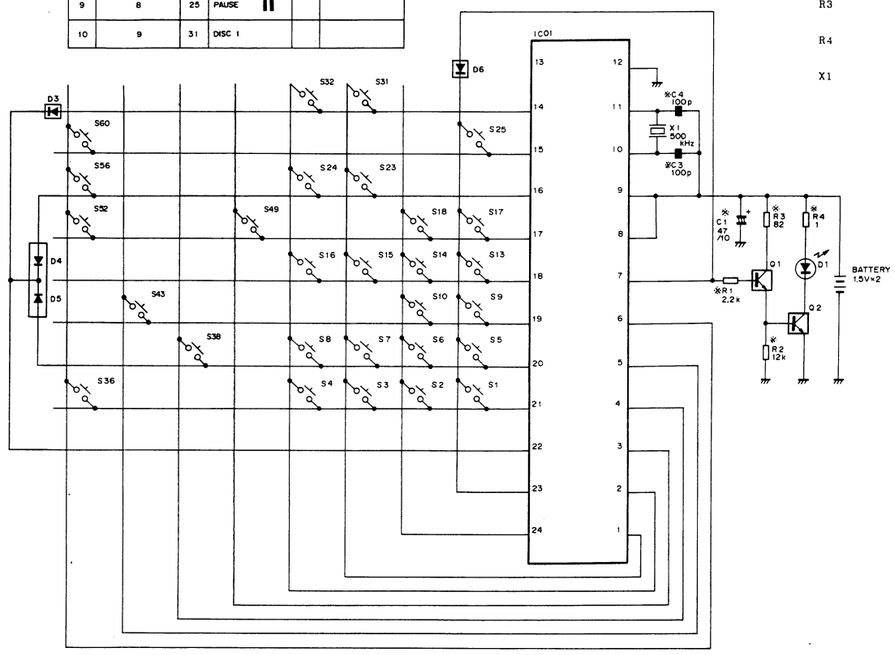
4. SWITCHES:

SW NO.	MODE	SW NO.	MODE	SW NO.	MODE
1	0	13	REPEAT	32	DISC 2
2	1	14	PROGRAM MEMORY	36	TIME
3	2	15	MANUAL ▶▶	38	CLEAR
4	3	16	MANUAL ◀◀	43	RANDOM PLAY
5	4	17	TRACK ▶▶|	49	DISC 3
6	5	18	TRACK |◀◀	52	DISC 4
7	6	23	STOP ■	56	DISC 5
8	7	24	PLAY ▶	60	DISC 6
9	8	25	PAUSE ❚❚		
10	9	31	DISC 1		

1. RESISTORS:
   Indicated in Ω, 1/4W, 1/6W and 1/8W, ±5% tolerance unless otherwise noted k; kΩ, M; MΩ, (F); ±1%, (G); ±2%, (K); ±10%, (M); ±20% tolerance
2. CAPACITORS:
   Indicated in capacity (μF)/voltage (V) unless otherwise noted p; pF. Indication without voltage is 50V except electrolytic capacitor.
3. OTHERS:
   ※ marked capacitors and resistors have parts numbers.
   This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

Indicates a chip resistor.
Indicates a chip capacitor.
Indicates a chip transistor.
Indicates a chip diode.

IC01	μPD6102G (μPD6122G)
Q1	2SC2412K (2SC2712Y)
Q2	2SD1781K (2SC3265Y)
D1	LD271E7317 (SE303AY)
D3-D5	PCX1005 (PCX1006) PCX1002 (PCX1003) (PCX1004)
D6	PCL1005 PCN1004 (PCN1005) (PCN1006) PCN1001 (PCN1002) (PCN1003)
C3, C4	PCN1013 (PCN1014) (PCN1015) PCN1010 (PCN1011) (PCN1012)
R1	KBR500BTL7 (CSB500EB)
R2	
R3	
R4	
X1	



4.4 CIRCUIT DIAGI

Symbol	Signal so
A	
A0 to A10	IC9-38 to
APCG	IC1-6
B1 to B4	
BCLK	IC9-76
C	
C•OUT	IC6-6
C1F1	IC9-62
C1F2	IC9-63
C2F1	IC9-64
C2F2	IC9-65
CA•DR	IC3-2
CLK	IC12-27
$\overline{CLMP}$	S102
CRCF	IC9-20
$\overline{CS}$	IC9-50
D1 to D8	IC9- 37 to 3 32 to 2
DATA	IC9-78
$\overline{DEMP}$	IC12-53
DIRC	IC12-51
EXCK	IC9-21
FO•DR	IC2-2
FO•ER	IC5-16
FO•IN	CN101-6
FO•OT	CN101-1
FO•RT	CN101-8
FOK	IC5-1
GFS	IC9-28
GND	
$\overline{INSD}$	S101
K	
KD0 to KD5	IC11 9 to 1 15, 17
$\overline{KS}$	IC201-11
L•IN	IC12-47
L•OUT	IC12-48
LD ON	IC12-54
LOAD +	IC4-2
LOAD −	IC4-10
LRCK	IC9-80

4.4 CIRCUIT DIAGRAM SYMBOL CODE TABLE

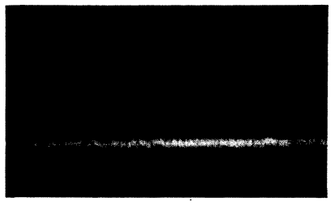
Symbol	Signal source	Signal name	Function
A			Tracking signal preceding detector
A0 to A10	IC9-38 to 48	Address Line	
APCG	IC1-6	APC GND	
B1 to B4			Respective outputs of 4 divided detector which detects RF and focus signals
BCLK	IC9-76	Bit clock	
C			Track counting pulse signal
C•OUT	IC6-6	Counter out	Tracking error signal which has carried out noise process
C1F1	IC9-62	Error flag	Flag which indicates state in which decoder LSI is carrying out error correction processing
C1F2	IC9-63	Error flag	
C2F1	IC9-64	Error flag	
C2F2	IC9-65	Error flag	
CA•DR	IC3-2	Carriage drive	Driving output of carriage motor
CLK	IC12-27	Clock	Control data (serial) clock to IC6 and IC9 (discontinuous)
$\overline{CLMP}$	S102	Clamp	State of disk tray (Closes at L and opens or being in shift at H)
CRCF	IC9-20		Outputs result of sub-code Q error detection (Outputs synchronized with SCOR signal)
$\overline{CS}$	IC9-50	Chip select	Control signal that makes RAM active
D1 to D8	IC9-$^{37\ to\ 34}_{32\ to\ 29}$	Data line	Data line with RAM
DATA	IC9-78	Data	Playback signal data to DAC (serial)
$\overline{DEMP}$	IC12-53	De-emphasis	De-emphasis ON/OFF signal (De-emphasis ON at L)
DIRC	IC12-51	Direct	Control signal during 1 track jump (Controls only during L)
EXCK	IC9-21	External clock	External clock input
FO•DR	IC2-2	Focus drive	Drive signal of focus actuator
FO•ER	IC5-16	Focus error	Focus error signal
FO•IN	CN101-6	Focus loop in	Focus servo gain adjusting input
FO•OT	CN101-1	Focus loop out	Focus servo gain adjusting output
FO•RT	CN101-8	Focus return	Detection of focus actuator drive current
FOK	IC5-1	Focus OK	When RF signal is obtained, output at H level that focus has been applied
GFS	IC9-28	GFS	Lock state output of frame SYNC (H during lock state)
GND		GND	
$\overline{INSD}$	S101	Inside	Detection signal indicating that pickup has come inside at mechanical section
K			
KD0 to KD5	IC11-$^{9\ to\ 12}_{15,\ 17}$	Key data	Matrix encode data of key ON/OFF
$\overline{KS}$	IC201-11	Key strobe	Output which indicates the key is being pressed (L output at key ON/OFF)
L•IN	IC12-47	Loading in	Control signal of loading in
L•OUT	IC12-48	Loading out	Control signal of loading out
LD ON	IC12-54	Laser diode	Signal which lights up laserdiode (Is lit at H)
LOAD +	IC4-2		Drive voltage output of loading motor
LOAD −	IC4-10		
LRCK	IC9-80	LR clock	Clock which selects Lch and Rch of decoder (DAC) (44.1kHz)

Symbol	Signal Source	Signal Name	Function
MIRR	IC5-18	Mirror	Pitless side (mirror surface) detector signal (pitless side: H)
MUTE	IC12-14	Muting	IC9 digital mute control signal
$\overline{RESET}$	IC32-5	Reset	Power ON reset signal
RFCK	CN104-7 (IC9-68)	Read frame clock	Standard frame clock signal (7.35kHz)
$\overline{RMKS}$	IC12-58	Remote control key	Remote control key strobe passed from remote control decoder (IC11) to main microprocessor (IC12)
SBS0	IC9-22		Sub-code serial output
SCK	IC12-41	Serial clock	FL display data transfer clock (400kHz)
SCLK	IC15-3	System clock	Audio playback system clock (8.4672MHz)
SCOR	IC9-24		Sub-code sync
SD	IC12-42	Serial data	Control signal passed to FL control CPU
SENS	IC6-5		Detector output bus from IC6 & IC9
SP•DR	CN4-5	Spindle drive	Spindle motor drive output
SP•RT	CN4-6	Spindle return	Spindle motor drive current detector
SRES	IC12-57	Sub reset	Key/display/microprocessor reset signal
STS	IC201-12	Status	Display data "ready to send"
SUBQ	IC9-23	Sub-code Q	Sub-code Q output (address and other data)
TR•DR	IC2-8	Tracking drive	Tracking actuator drive signal
TR•ER	IC5-17	Tracking error	Tracking servo error output
TR•IN	CN101-7	Tracking loop in	Tracking servo gain adjustment input
TR•OT	CN101-2	Tracking loop out	Tracking servo gain adjustment output
TR•RT	CN101-9	Tracking return	Tracking actuator drive current detector
WCLK	IC15-8		Digital filter 88.2kHz strobe signal input
$\overline{WE}$	IC9-49	Write enable	RAM write enable
WFCK	IC9-69	Write from clock	Frame clock signal made from data (frame sync. lock: 7.35kHz)
$\overline{XLT}$	IC12-12		Servo and decode IC serial data latch clock pulse signal
DCNT	IC12-24	DISC COUNT	Count pulse input to detect DISC SELECT
DCHM	IC12-26	DISC HOME	DISC SELECT home position detection SW input
LPS1	IC12-28	Loading position	Loading position detection SW input
LPS2	IC12-29	Loading position	Loading position detection SW input
MZS1	IC12-30	MAGAZINE DC-TEG	Magazine and its kind detection SW input
MZS2	IC12-31	MAGAZINE DC-TEG	Magazine and its kind detection SW input
DSUP	IC12-45	DISC SELECT UP	DISC SELECT motor drive output
DSDW	IC12-46	DISC SELECT DOWN	DISC SELECT motor drive output

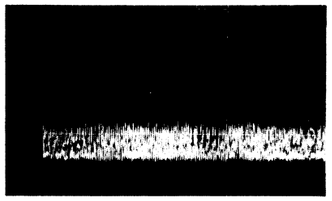
4.5 WAVE FORMS

NOTE: The encircled numbers denote measuring points in the circuit and pattern diagrams.

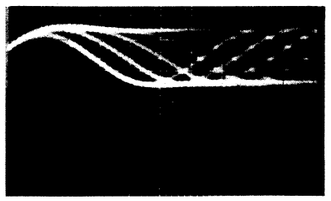
① CN102-2 MODE : PLAY
V: 200mV/div H: 2m sec/div



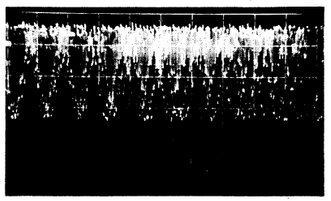
① CN102-2 MODE : SEARCH
V: 200mV/div H:2m sec/div



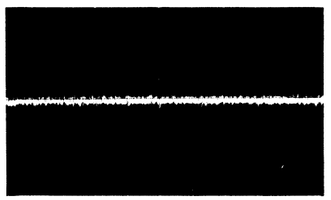
② CN105-1 MODE : PLAY
V: 1V/div H: 200n sec/div



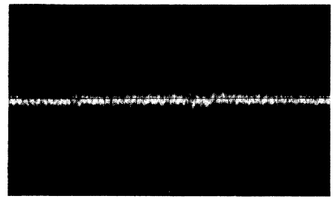
② CN105-1 MODE : SEARCH
V: 500mV/div H: 100μsec/div



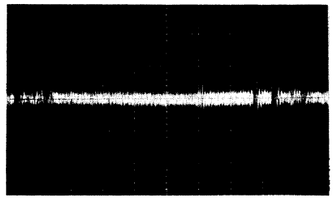
③ CN101-3 MODE : PLAY
V: 500mV/div H: 5m sec/div



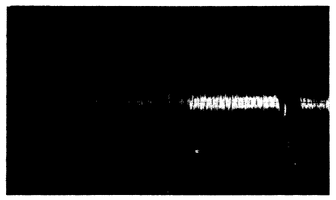
③ CN101-2 MODE : SEARCH
V: 500mV/div H: 5m sec/div



④ CN101-4 MODE : PLAY
V: 2V/div H: 20m sec/div

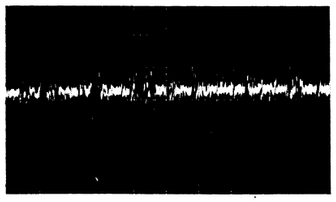


④ CN101-4 MODE : SEARCH
V: 2V/div H: 20m sec/div

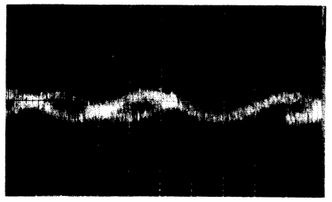


⑤ CN101-8 MODE : PLAY
V: 500mV/div H: 10m sec/div

⑤ CN101-8 MODE : SEARCH
V: 500mV/div H: 10m sec/div

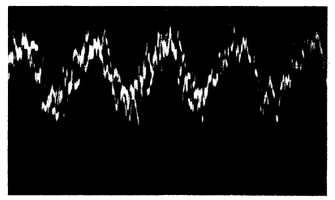


⑥ CN101-9 MODE : PLAY
V: 500mV/div H: 10m sec/div

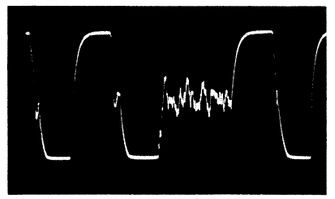


⑥ CN101-9 MODE : SEARCH
V: 500mV/div H: 10m sec/div

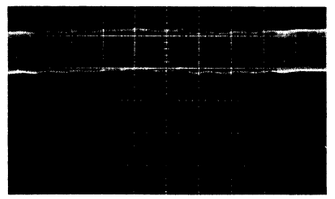
⑦ IC8-1 MODE : PLAY
V: 200mV/div H: 50m sec/div



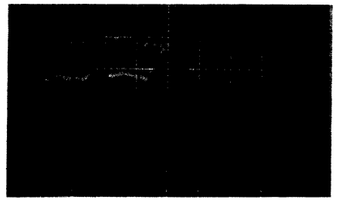
⑦ IC8-1 MODE : SEARCH
V: 2V/div H: 200m sec/div



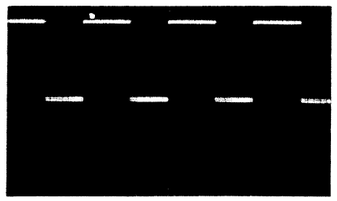
⑧ IC8-7 MODE : PLAY
V: 500mV/div H: 20m sec/div



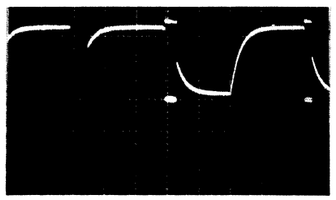
⑧ IC8-7 MODE : SEARCH
V: 500mV/div H: 20m sec/div



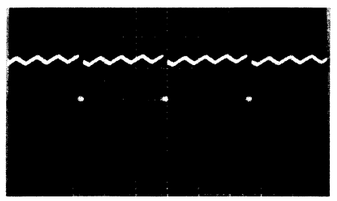
⑨ IC9-4 MODE : PLAY
V: 2V/div H: 50μsec/div



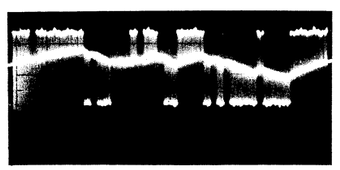
⑨ IC9-4 MODE : SEARCH
V: 2V/div H:100m sec/div



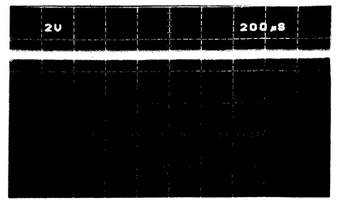
⑩ IC9-3 MODE : PLAY
V: 2V/div H: 200μsec/div



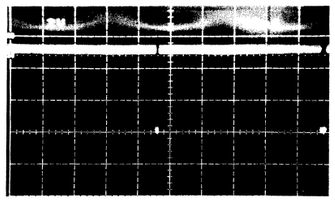
⑩ IC9-3 MODE : SEARCH
V: 2V/div H: 10m sec/div



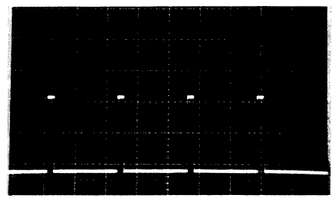
⑪ CN104-1 MODE : PLAY
V: 2V/div H: 20m sec/div



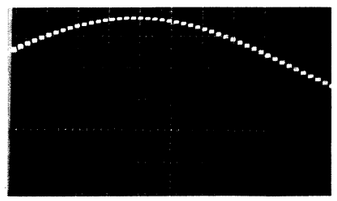
⑪ CN104-1 MODE : SEARCH
V: 2V/div H: 200μsec/div



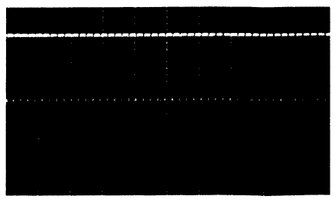
⑫ IC15-23 MODE : PLAY or SEARCH
V: 2V/div H: 5μsec/div



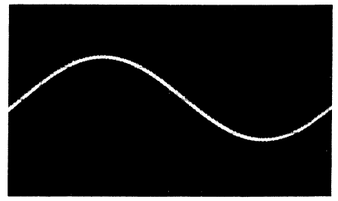
⑬ IC17-1 MODE : PLAY
V: 2V/div H: 50μsec/div



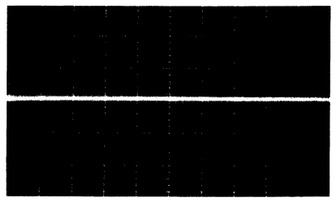
⑬ IC17-1 MODE : SEARCH
V: 2V/div H: 50μsec/div



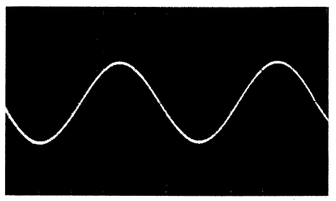
⑭ IC17-7 MODE : PLAY
V: 2V/div H: 100μsec/div



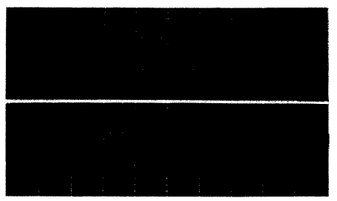
⑭ IC17-7 MODE : SEARCH
V: 2V/div H: 100μsec/div



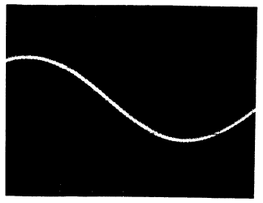
⑮ OUT L MODE : PLAY
V: 2V/div H: 200μsec/div



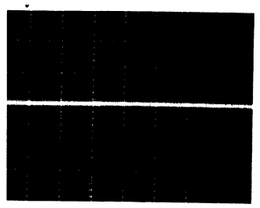
⑮ OUT L MODE : SEARCH
V: 2V/div H: 200μsec/div



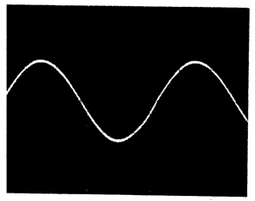
' MODE : PLAY
2V/div H: 100μsec/div



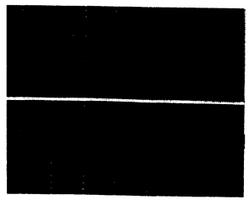
' MODE : SEARCH
2V/div H: 100μsec/div



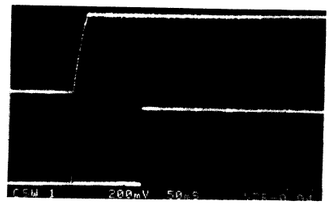
MODE : PLAY
V/div H: 200μsec/div



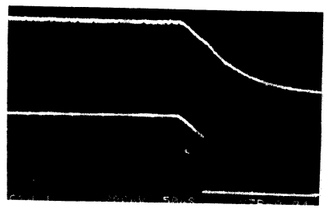
MODE : SEARCH
V/div H: 200μsec/div



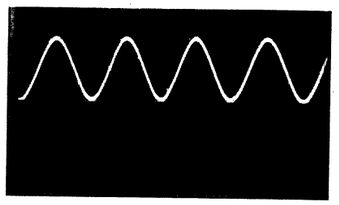
(17) IC32-5 POWER ON
V:2V/div H:50msec/div



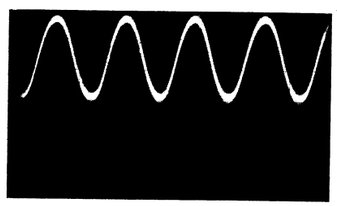
(17) IC32-5 POWER OFF
V:2V/div H:50msec/div



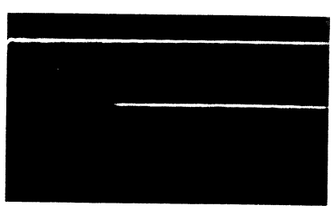
(18) IC9-9 MODE : STOP
V: 2V/div H: 50m sec/div



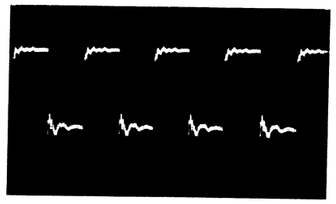
(19) IC9-8 MODE : STOP
V: 1V/div H: 50m sec/div



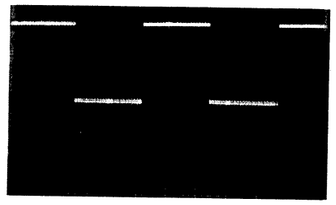
(20) IC9-5 MODE : PLAY
V: 2V/div H: 200 sec/div



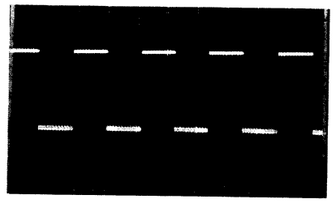
(21) IC9-76 MODE : STOP
V: 2V/div H: 200m sec/div



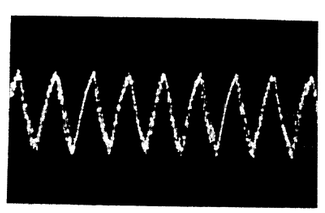
(22) IC9-80 MODE : STOP
V: 2V/div H: 5μsec/div



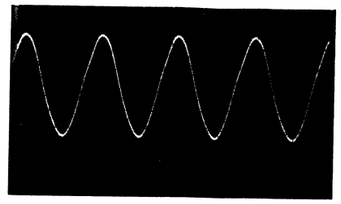
(23) IC9-79 MODE : STOP
V: 2V/div H: 5μsec/div



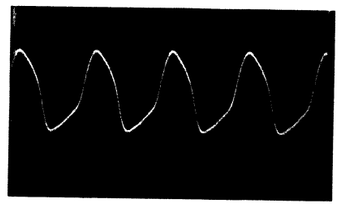
(24) IC15-3 MODE : STOP
V: 2V/div H: 50n sec/div



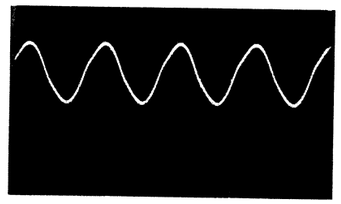
(26) IC11-5 MODE : STOP
V: 2V/div H: 500n sec/div



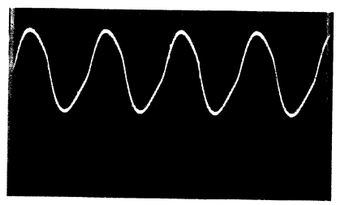
(27) IC11-6 MODE : STOP
V: 2V/div H: 500n sec/div



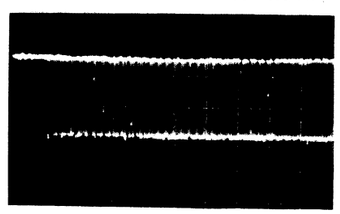
(28) IC12-6 MODE : STOP
V: 2V/div H: 100n sec/div



(29) IC12-5 MODE : STOP
V: 2V/div H: 100n sec/div

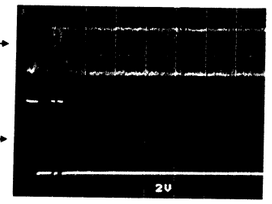


(30) IC15-10 MODE : PLAY
V: 2V/div H: 200n sec/div



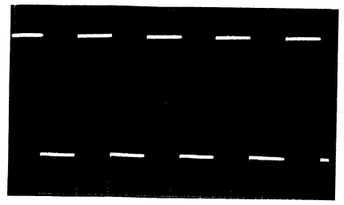
(31) IC5-18 MODE : PLAY
V: 2V/div H: 200n sec/div

IC5-3 (RF) →
IC5-18 (MIRR) →



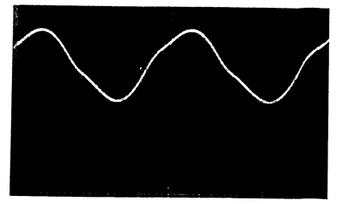
(32)

(33) IC15-11 MODE : STOP
V: 2V/div H: 5μsec/div

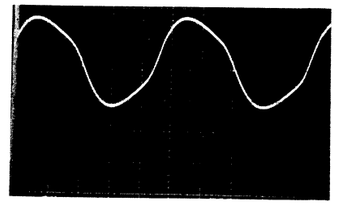


(34)

(35) IC201-2 MODE : STOP
V: 2V/div H: 500n sec/div



(36) IC201-3 MODE : STOP
V: 2V/div H: 500n sec/div



5. ELECTRICAL PARTS LIST

NOTES:

- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*
  Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).

560Ω	*56 × 10¹*	*561 ..... RD¼PS 5610 J*	
47kΩ	*47 × 10³*	*473 ..... RD¼PS 4703 J*	
0.5Ω	*0R5*	*..... RN2H 0R50 K*	
1Ω	*010*	*..... RS1P 0100 K*	

  Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	*562 × 10¹*	*5621 .... RN¼SR 5621 F*	

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★ .*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification should be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by " ⊙ " are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

Miscellaneous Parts
P.C BOARD ASSEMBLIES

Mark		Symbol & Description	Part No.
⚠	⊙	Main board assembly	PWZ1051
	⊙	Control board assembly	PWZ1053
	⊙	Audio board assembly	PWZ1052
		Pick up assembly	PWY-006
⚠		Power switch board assembly	Non supply
⚠		Transformer board assembly	Non supply
		Subcode board assembly	Non supply
		Select board assembly	Non supply
		Headphone board assembly	Non supply
		Remote control board assembly	Non supply
⚠		Switch board assembly	Non supply
		Loading board assembly	Non supply

OTHERS

Mark		Symbol & Description	Part No.
⚠		AC Socket (AC OUTLET)	AKP-507
⚠		Strain relief	CM-22C
⚠	★	Power transformer(AC120V)	PTT1004
⚠		AC Power cord	PDG1002 (PDG1015)
	★★	Motor assembly (CARRIAGE)	PYY-504
	★★	Motor assembly (LOADING)	PYY-508
	★★	Motor assembly (DISC SELECT)	PYY-507
	★★	Spindle motor	PXM-147
	★★	S101 Slide switch	PSH-007
	★★	Remote control unit	PWW1005

Main Board Assembly (PWZ1051)

SEMICONDUCTORS

Mark		Symbol & Description	Part No.
	★★	IC21	AN78L12
	★★	IC20	AN79L12
	★★	IC9	CXD1135Q
	★★	IC10	CXK5816M-12L (CXK5816M-15L)
	★★	IC6	CX20108
	★★	IC4, IC27	BA6109
	★★	IC5	CX20109
⚠	★★	IC24, IC25	ICP-F15
⚠	★★	IC23	M5F78M05
⚠	★★	IC22	M5F79M05
	★★	IC32	M51957AL
	★★	IC8	M5238LF
	★★	IC11	PDE003
	★★	IC12	PD3085
⚠	★★	IC2, IC3	TA7256P
	★★	Q22	DTC124ES
	★★	Q23	2SA1048 (2SA1015)
	★★	Q21	2SA933S
	★	D6	KV1225YBR (KV1226YBR)
	★	D4	MTZ11C
	★	D23	RD27EB2 (RD27EB3)
	★	D13—D22	S5566B
	★	D27, D28	1SS254
	★	D3, D24	MTZ5.1B (MTZ5.1C)

COILS

Mark	Symbol & Description	Part No.
	L4—L6	LRA010K
	VL1 VCO coil	PTL-031

CAPACITORS

Mark	Symbol & Description	Part No.
	C29	CCDCH330J50
	C8, C31	CCCSL101J50
	C46, C66, C67	CCCSL221J50
	C71, C72	CCCSL330J50
	C25, C26	CCCSL470J50
	C14, C21, C27	CCCSL560J50
	C7	CCCSL680J50
	C52	CCCUJ221J50
	C53	CCCUJ330J50
	C48	CEANL010M50
	C44	CEANP010M50
	C49	CEANP100M35
	C34, C57	CEANP2R2M50
	C42	CEASR33M50
	C22	CEASR47M50
	C137, C138	CEAS101M50
	C5, C6, C17, C19, C23, C36, C38, C68, C70, C79 C162, C50	CEAS330M35
	C139	CEAS470M50
	C11—C13, C47, C63, C64, C80, C115	CKCYF103Z50
	C10	CKCYF473Z50
	C9	CKCYX473M25
	C37	CQMA102J50
	C55, C60	CQMA103J50
	C56	CQMA104J50
	C15, C39, C41	CQMA104K50
	C16, C45	CQMA222J50
	C30, C59	CQMA223J50
	C33	CQMA224J50
	C20	CQMA333J50
	C28	CQMA472J50
	C40	CQMA682J50
	C35, C43	CQMA683J50
	C58	CQMA822J50
	C133, C134 (2200μF/16V)	PCH1037
	C127, C128 (1000μF/25V)	PCH1041
	C129, C130 (2200μF/25V)	PCH1042
	C135, C136 (3300μF/25V)	PCH1043

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	R79, R112	RA4S103J
	R101	RA4S473J
	R111	RA7S103J
	R113	RA8S103J
	R8, R9	RD1/2PM4R7J
	R117	RD1/4PM103J
	R11	RD1/4PM2R7J
	R63, R85, R62, R84	RN1/6PQ□□□□F
⚠	R10, R190	RD1/6PM3R6J
★	VR3, VR4 Semi-fixed	VRTB6VS103
★	VR5 Semi-fixed	VRTB6VS104
★	VR2, VR6 Semi-fixed	VRTB6VS473
	Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
★	X2 Ceramic resonator	KBR-4.0MS
★	X3 Ceramic resonator	KBR-800H

Control Board Assembly (PWZ1053)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC201	PD4063
★★	Q201, Q203	DTC124ES
★★	Q205—Q209	2SC1740S
★	D214	MTZ5.1B (MTZ5.1C)
★	D211 LED(PAUSE)	SLH-56DC3H
★	D215 LED (PLAY)	SLH-56MC3H
★	D203—D210	1SS254

SWITCHES

Mark	Symbol & Description	Part No.
★★	S201—S209, S211—S230 Tact switch 3(TRACK No.), 6 (DISC No.), PGM MEMORY, CLEAR, 5(D.No.), 0(T.No.), TIME, REPEAT, RANDOM PLAY, TRACK SEARCH, 9(T.No.), 6(T.No.), PLAY, PAUSE, STOP, EJECT, 2 (T.No.), 5(T.No.), MANUAL SEARCH, 8 (T.No.), 7(T.No.), 4(T.No.), 1(T.No.), 4(D.No.), 3(D.No.), 2(D.No.), 1(D.No.)	PSG-064

COILS

Mark	Symbol & Description	Part No.
	L201, L202 Inductor	LRA010K

CAPACITORS

Mark	Symbol & Description	Part No.
	C204	CEAL100M16
	C201	CEAL3R3M50
	C205, C206	CKCYF103Z50
	C202, C203	CCCSL331J50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	R201—R205	RD1/4PM124J
	Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & De
★	V201 Fluores
★	X201 Ceramic

Audio Board Assen

SEMICONDUCTORS

Mark	Symbol & De
★★	IC15
★★	IC17, C18
★★	IC19
★★	Q17, Q18
★★	Q12
★★	Q13, Q14
★	D7, D8, D25,

COIL AND FILTERS

Mark	Symbol & De
	F1, F2 Low p
	L1 OSC coil

CAPACITORS

Mark	Symbol & De
	C82
	C83
	C88, C90, C1
	C97, C98
	C117, C118
	C85, C87, C8
	C81, C94
	C96, C111
	C86
	C99—C104, C144
	C109, C110, C125, C126

RESISTORS

NOTE: When ordering r into code form, a

Mark	Symbol & D
	R129, R143
	R147— R14
	R130, R133-
	R146, R159,
	Other resisto

OTHERS

Mark	Symbol & D
★	X4 Crystal re
	JA1 2P pin

Pick-up assembly

The parts mounted on supplied as a single part.

OTHERS

Mark	Symbol & Description	Part No.
★	V201 Fluorescent tube	PEL1002
★	X201 Ceramic resonator	RSS-034

Audio Board Assembly (PWZ1052)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC15	CX20152
★★	IC17, C18	M5238PF
★★	IC19	BU4053B
★★	Q17, Q18	2SD1302
★★	Q12	2SA933SLN (2SA933LN)
★★	Q13, Q14	2SK152
★	D7, D8, D25, D26	HZ6A1L (HZ6A2L)

COIL AND FILTERS

Mark	Symbol & Description	Part No.
	F1, F2 Low pass filter	PTF1005
	L1 OSC coil	PTL-022

CAPACITORS

Mark	Symbol & Description	Part No.
	C82	CCCCH220J50
	C83	CCCCH680J50
	C88, C90, C123, C124	CEAS100M50
	C97, C98	CEAS101M25
	C117, C118	CEAS220M50
	C85, C87, C89, C92	CEAS330M35
	C81, C94	CKCYB102K50
	C96, C111	CKCYF103Z50
	C86	CQMA103K50
	C99—C104, C107, C108	CQMA104K50
	C144	CQMA333K50
	C109, C110, C121, C122	CQSF102J125
	C125, C126	CQSF221J125

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	R129, R143, R144, R147— R149, R150	RDR1/4PM□□□J
	R130, R133—R142, R145, R146, R159, R186	RD1/4PM□□□J
	Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
★	X4 Crystal resonator	PSS-009
	JA1 2P pin jack (AUDIO OUT)	VKB-006

Pick-up assembly (PWY-006)

The parts mounted on the Pick-up assembly cannot be supplied as a single part.

Power Switch Board Assembly

SWITCH

Mark	Symbol & Description	Part No.
⚠ ★★	S401 Power switch (POWER)	PSA-009

CAPACITOR

Mark	Symbol & Description	Part No.
⚠	C401 (0.01μF/AC400V)	RCG-009 (VCG-004)

Transformer board assembly

CAPACITORS

Mark	Symbol & Description	Part No.
⚠	C402, C405, C406	CKDYF103Z50
	C403, C404, C407—C410	CKDYF103Z50

Subcode Board Assembly

OTHERS

Mark	Symbol & Description	Part No.
	JA501 Socket (SUBCODE OUT)	PKP-038

Select Board Assembly

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★★	Q601	GP1A01

SWITCH

Mark	Symbol & Description	Part No.
★★	S601 Slide switch (MODE)	PSH-006

CAPACITORS

Mark	Symbol & Description	Part No.
	C601	CEAS100M50
	C602	CKCYF103Z50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	All resistors	RD1/6PM□□□J

Headphone Board Assembly

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC301	M5218L

CAPACITORS

Mark	Symbol & Description	Part No.
	C301, C302	CQMA104K50
	C304—C306	CKCYB472K50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
★	VR301 Variable resistor (PHONES LEVEL, 20k)	PCS-030
	R301	RD1/4PM472J
	Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
	JA301 Jack (PHONES)	PKN1001

Remote Control board assembly

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	Q204	DTA124ES
★	D212 LED (REMOTE CONTROL SIGNAL RECEPTION)	SLH-56VC3H

RESISTORS

Mark	Symbol & Description	Part No.
	R219	RD1/6PM681J
	R220, R221	RD1/6PM103J

OTHERS

Mark	Symbol & Description	Part No.
	Remote control receiver	BX-1387

Switch board assembly

Switches

Mark	Symbol & Description	Part No.
★★	S701—S704 Slide switch	PSH-006

Loading board assembly

There are no component parts on the Loading board assembly.

Remote Control Unit

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC1	μPD6102G (μPD6122G)
★★	Q1	2SC2412K (2SC2712Y)
★★	Q2	2SD1781K (2SC3265Y)
★	D1 LED	LD271E7317 (SE303AY)
★	D3—D5	PCX1005 (PCX1006)
★	D6	PCX1002 (PCX1003) (PCX1004)

CAPACITORS

Mark	Symbol & Description	Part No.
	C1	CEUSH1A470 (SH10VB-47(H))
	C3, C4 (100pF)	PCL1005

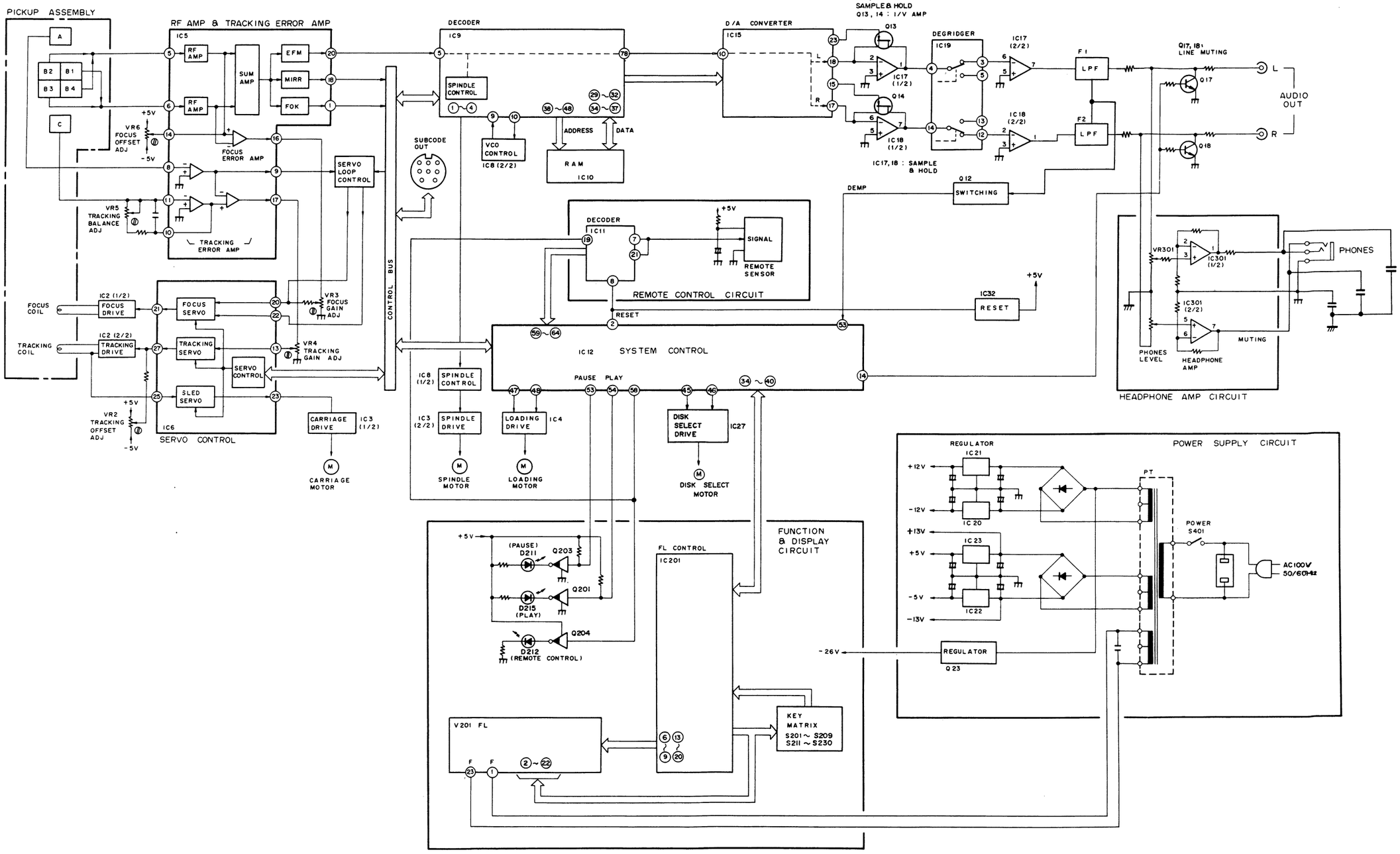
RESISTORS

Mark	Symbol & Description	Part No.
	R1 (2.2kΩ)	PCN1004 (PCN1005) (PCN1006)
	R2 (12kΩ)	PCN1001 (PCN1002) (PCN1003)
	R3 (82Ω)	PCN1013 (PCN1014) (PCN1015)
	R4 (1Ω)	PCN1010 (PCN1011) (PCN1012)

OTHERS

Mark	Symbol & Description	Part No.
★	X1 Ceramic resonator (500kHz)	KBR500BTL7 (CSB500EB)

6. BLOCK DIAGRAM



7. CIRCUIT DESCRIPTIONS

7.1 SERVO SECTION

Servo control in this CD player is performed using two LSIs (CX20109, CX20108) configured around a system control CPU. Each LSI is connected to the CPU by a data bus. All control is performed using the serial data from the CPU. The data pattern will be described later.

The primary servo control systems of the CD player are listed below.

1. Focus servo
2. Tracking servo
3. Spindle servo

An explanation of these three systems follows.

7.1.1 The Focus Servo Loop

Purpose:

To control the distance between lens and disk so as to keep the laser beam always focused on the pits on the CD.

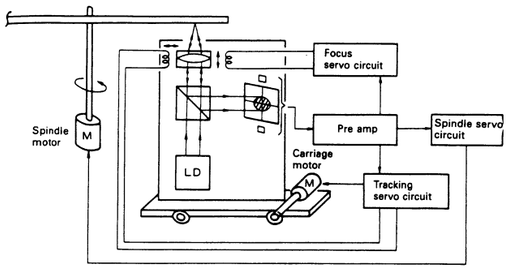


Fig. 7-1 Focus servo loop circuit

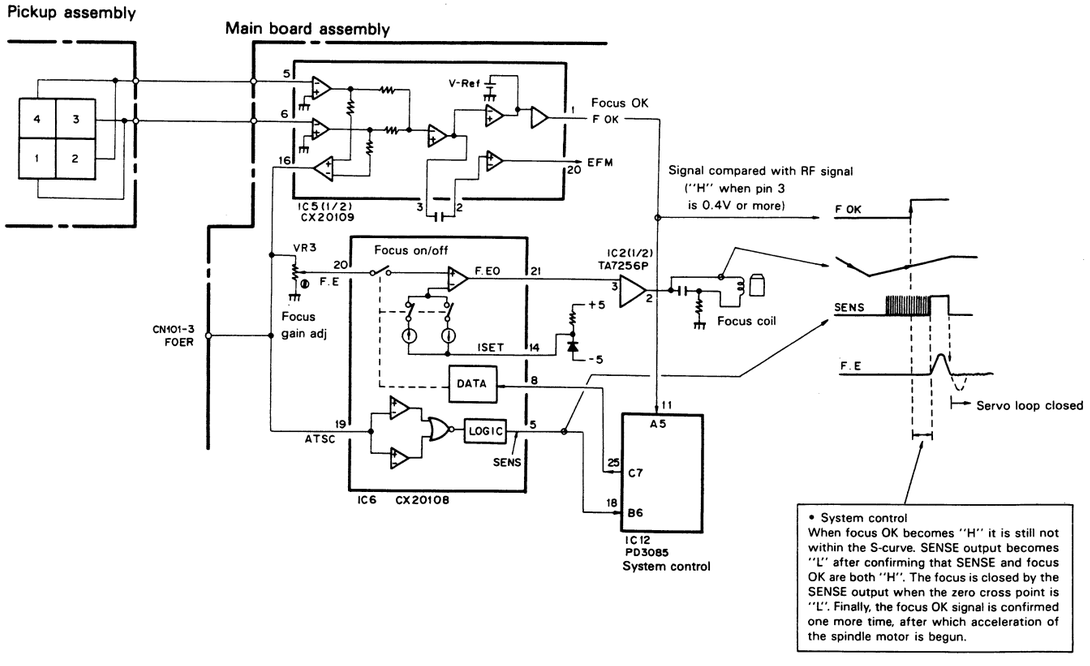


Fig. 7-2 Block diagram of focus servo

FOCUS SERVO

When the focus servo does not lock, focus-in is performed one more time. If the result is still unsatisfactory, focus-in operation is stopped.

START-UP CONDITIONS

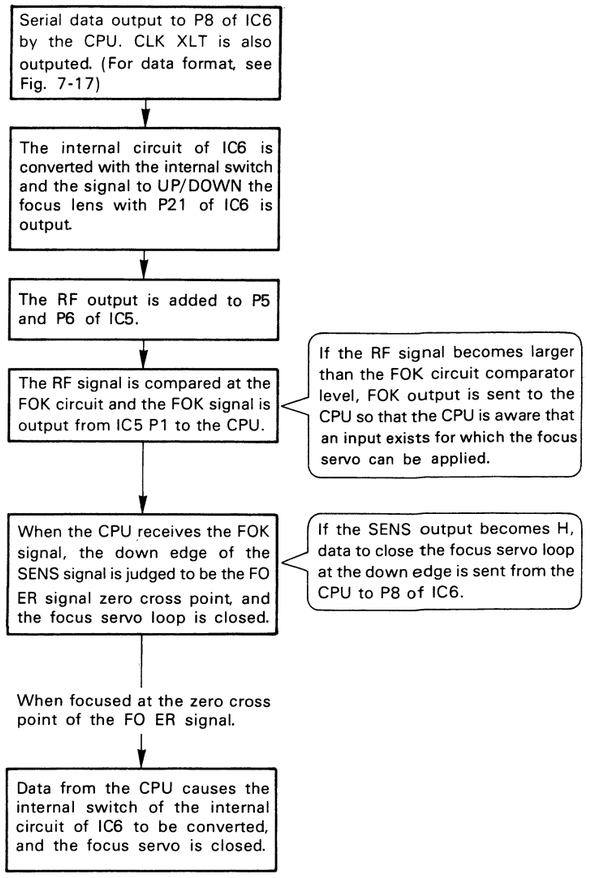
1. Disc is loaded.
2. Laser diode is emitting a beam.
3. Focus start-up data is being output from the system control PD3085 (IC12).

SUMMARY OF OPERATION

1. Lens is forcibly moved down and then up (internally processed by CX20108 (IC6)).
2. The related signals are as follows when the zero cross is discovered during this lens movement:
   a) SENS output: Goes to focus lock after generation. *1
   b) Focus OK output (H level): If system control does not confirm the existence of this output, focus lock is not performed. Furthermore, this output is checked again before proceeding to the next step.
   c) Focus error signal: Generates zero cross (s-curve).

   *1: When zero cross is detected using the SENS output, → the focus servo loop is closed.

3. The next step is acceleration of the spindle motor and tracking.


Serial data output to P8 of IC6 by the CPU. CLK XLT is also outputed. (For data format, see Fig. 7-17)
The internal circuit of IC6 is converted with the internal switch and the signal to UP/DOWN the focus lens with P21 of IC6 is output.
The RF output is added to P5 and P6 of IC5.
The RF signal is compared at the FOK circuit and the FOK signal is output from IC5 P1 to the CPU.
If the RF signal becomes larger than the FOK circuit comparator level, FOK output is sent to the CPU so that the CPU is aware that an input exists for which the focus servo can be applied.
When the CPU receives the FOK signal, the down edge of the SENS signal is judged to be the FO ER signal zero cross point, and the focus servo loop is closed.
If the SENS output becomes H, data to close the focus servo loop at the down edge is sent from the CPU to P8 of IC6.
When focused at the zero cross point of the FO ER signal.
Data from the CPU causes the internal switch of the internal circuit of IC6 to be converted, and the focus servo is closed.

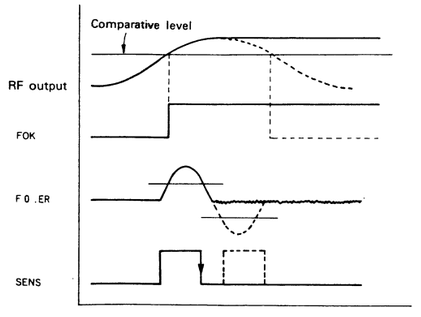


Fig. 7-3

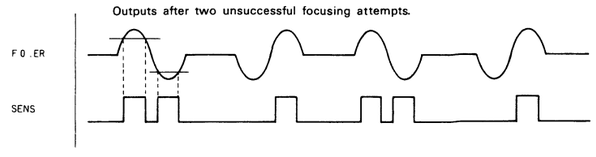


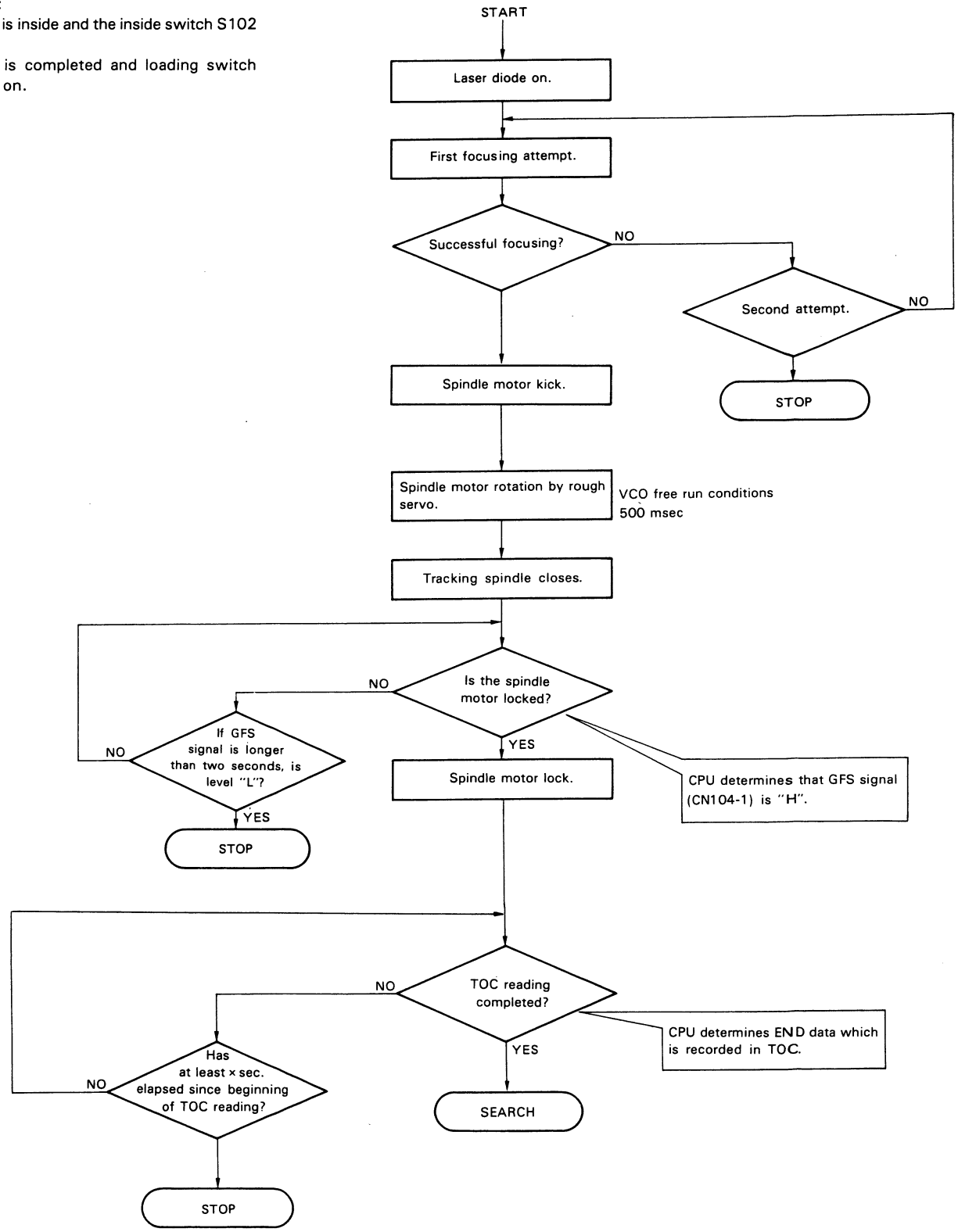
Fig. 7-4

Initial Settings for Reading of Table of Contents

Conditions:

★ Carriage is inside and the inside switch S102 is on.

★ Loading is completed and loading switch S101 is on.



7.1.2. Tracking Servo Loop Circuit

PURPOSE:

To control output from pickup so that the laser beam always hits the track (continuous bits) on the disk. Other than the aforementioned, when jumping or the intended music searching, the intended music is searched by adroitly turning ON and OFF the tracking servo.

Start-up Conditions

1. Proper focusing (FOK signal)
2. Spindle motor rotating.

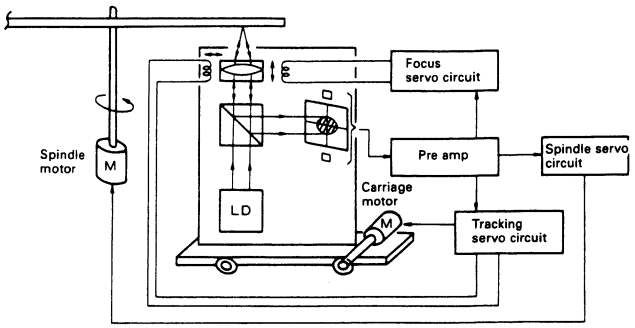
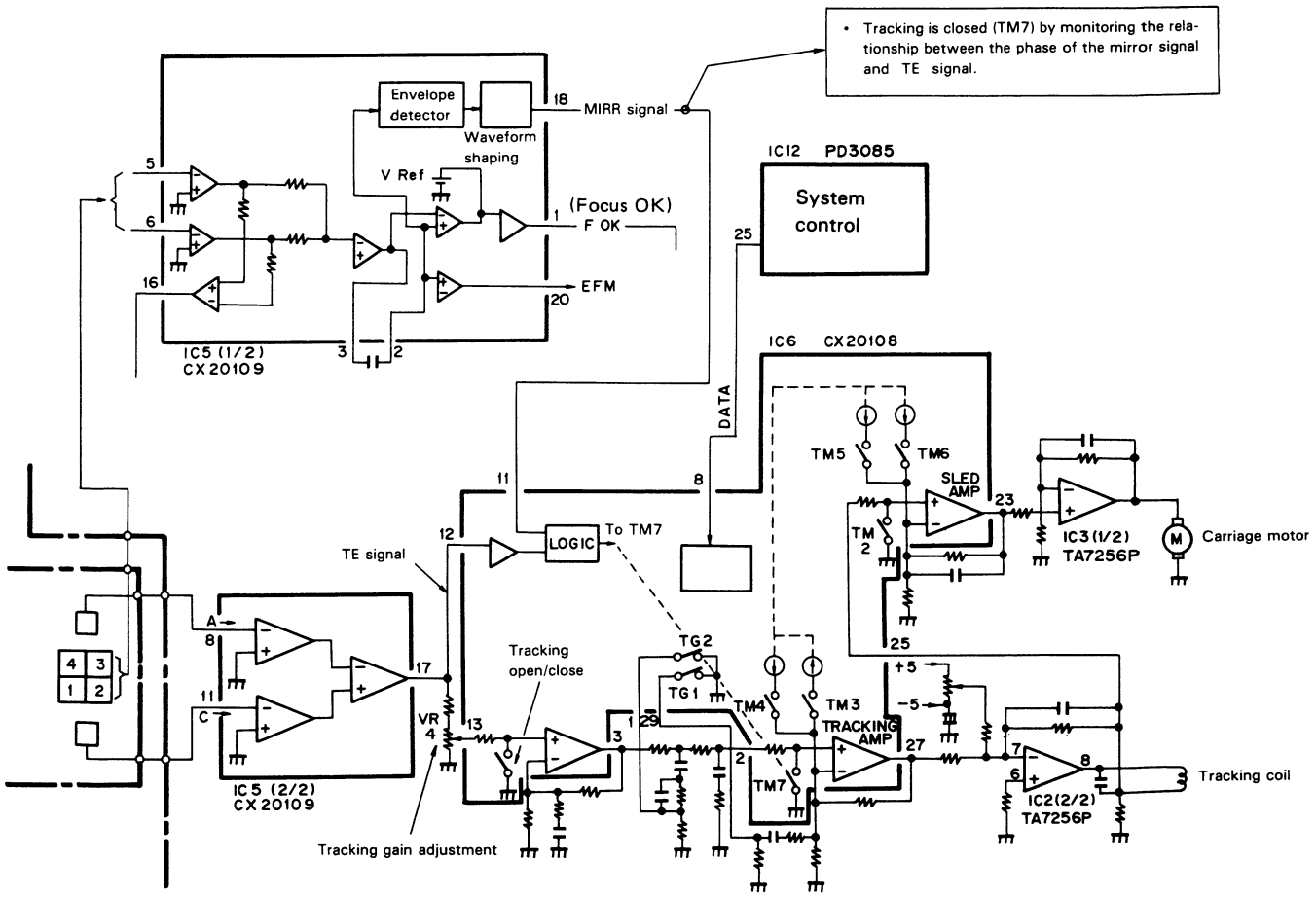


Fig. 7-5 Tracking servo loop circuit



Block diagram of tracking servo

Fig. 7-6

Summary of Operation

1. When the FOK signal is confirmed by the system control, acceleration of the spindle motor begins and the "start tracking" data are output.
2. The RF and TE signals are obtained from the pickup. The RF signal is then used to produce the MIRR signal. When RF exists, this signal is "L"; when RF does not exists, the MIRR signal is "H".
3. The system controller indirectly knows tracking has begun because
   (1) When RF signal exists, FOK becomes "H"
   (2) The GFS signal. (For details, see spindle servo.)
4. The next step is spindle lock.

7.1.3. Spindle Servo Loop Operation

Purpose:

To control disc rotation speed so that constant linear velocity (CLV) is maintained. (When the outside of the disk is read, it is low speed, and the inside is high speed.)

Standard:

The servo controls the spindle rotation speed to maintain the frame synch encoded in the disc pits at 7.35 kHz.

Start-up conditions

1. Proper focusing (FOK signal)

Summary of Spindle Lock Operations

1. When the focus OK signal is confirmed by the system control, spindle acceleration is triggered for an interval of 300m sec.
2. When tracking (with ON TRACK) has begun and the PLL is locked, CXD1135Q generates an "H" GFS signal.
3. This GFS signal is how the system control knows the tracking and spindle servo loops are locked.

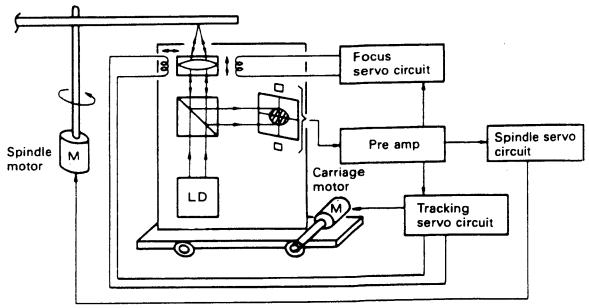
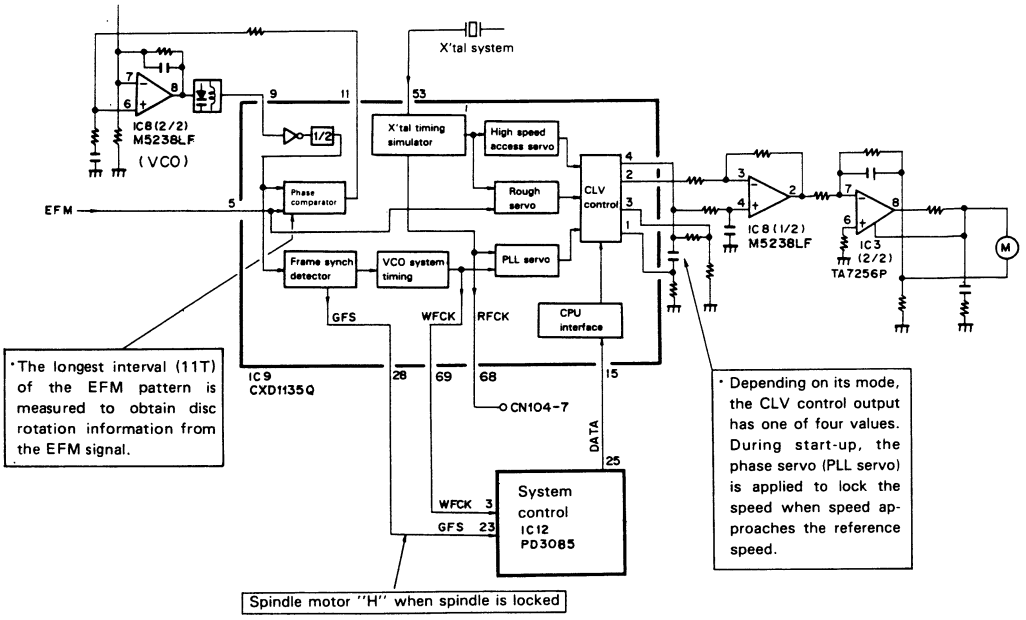


Fig. 7-7


X'tal system
IC8(2/2) M5238LF (VCO)
EFM
X'tal timing simulator
High speed access servo
Phase comparator
Rough servo
CLV control
Frame synch detector
VCO system timing
PLL servo
GFS
WFCK
RFCK
CPU interface
IC9 CXD1135Q
CN104-7
DATA
System control IC12 PD3085
IC8(1/2) M5238LF
IC3 (2/2) TA7256P
·The longest interval (11T) of the EFM pattern is measured to obtain disc rotation information from the EFM signal.
· Depending on its mode, the CLV control output has one of four values. During start-up, the phase servo (PLL servo) is applied to lock the speed when speed approaches the reference speed.
Spindle motor "H" when spindle is locked

Block diagram of spindle servo

Fig. 7-8

7.2 CIRCUIT DESCRIPTIONS

7.2.1. Preamp

This section processes the output signal received from the pickup and then sends signals to the servo section of the next stage, the demodulator and the controller. CX20109 and other parts of the preamp are described below.

The IC is a 24-pin flat package; its internal configuration is shown in Fig. 7-9.

A description of the internal parts of the IC follows.

① RF amp

The pin diode currents input at PD1 and PD2 each undergo I-V conversion at the 60kohm equivalent input resistors of RF I-V amps (1) and (2). Then (B1 + B2 + B3 + B4), added at the RF summing amp, is output to RFO. (An eye pattern check can be performed at this terminal.)

The low frequency component of the RFO output voltage VRFO is:

VRFO = −[(R30 + R32)/10kohms] × (VA + VB)
= [(R30 + R32)/10kohms] × (iPD1 + iPD2) × 60kohms

Furthermore, C29 and R33 have been provided because they are necessary for equalizing the EFM eye pattern and are set to match the system.

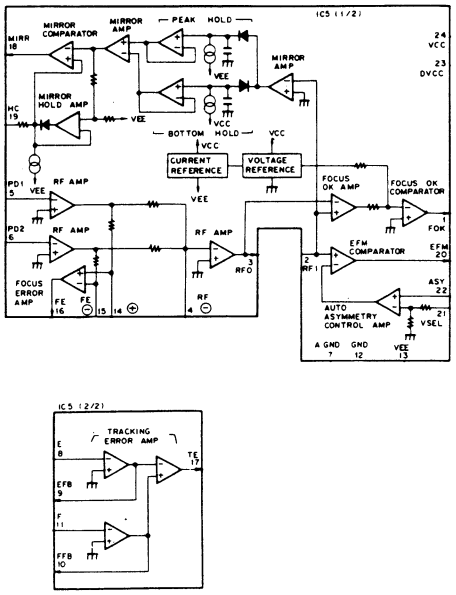


Fig. 7-9

This equalizer raises high range gain at an external circuit. The equalizer has a response peak in the high range to compensate for the drop in high range gain in the IC itself. The RFO output (pin 3) is an RF (DC) signal having a peak of 2.3V (DC) and a bottom of 0.5V (DC).

The high range pole setting is 2.5.MHz, however this is attenuated above around 1MHz because of the high range characteristics of the op amp inside the IC. As a result, the amplitude of high range signals such as 3T is raised.

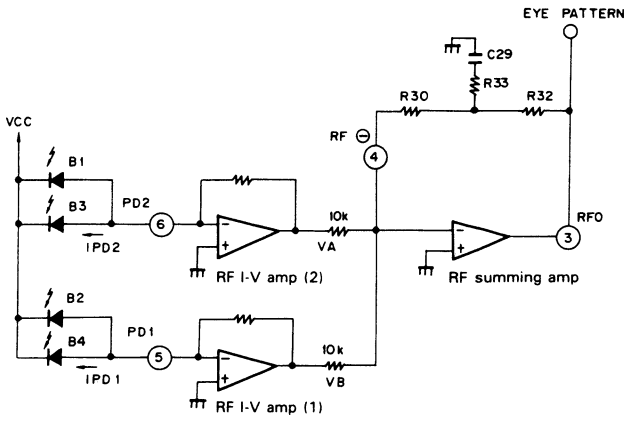


Fig. 7-10

② Focus error amp

The difference between the output of the RF I-V amp (1) (B2 + B4) and RF I-V amp (2) (B1 + B3), B1 + B3 − B2 − B4, is computed and output.

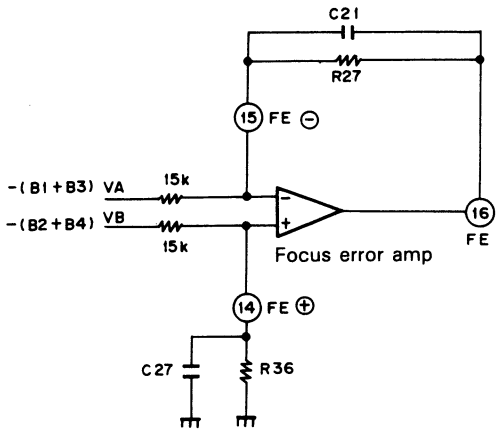


Fig. 7-11 Focus error amp circuit

When R27 = R36, the FE output voltage (low frequency) is:

VFE = (R27/15kohms) × (VA − VB) = (R27/15kohms) × (iPD2 − iPD1) × 60k

C21, C27 are needed to prevent leakage of the EFM component into the focus error output. Due to the gain setting, R27 = R36 = 100 (kohms) and C21 = C27 = 56 (pF). That means fc = 28.4kHz. For the pin 16 output, a 5 Vp-p output in the form of an S curve is output.

③ Tracking error amp

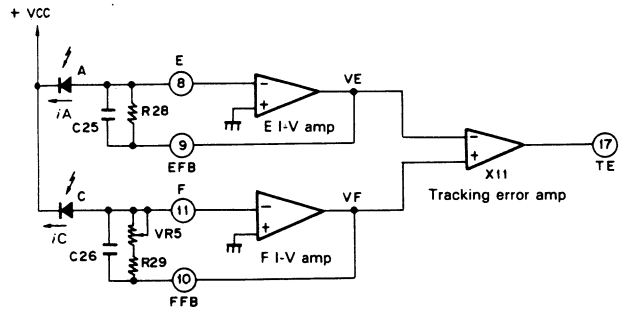


Fig. 7-12 Tracking error amp circuit

The current of the sidespot pin diode that is input at E and F undergoes I-V conversion at the E and F I-V amps (R28 and R29 + VRS) in the following manner:

VE = iAR28

VF = iC (R29 + VR5)

Furthermore, by taking the difference of EI-V and FI-V amps with the tracking error amp, the (E-F) output is obtained. The gain of the tracking error amp at 11 (21 dB) is:

VTE = (VE-VF) × 11 = (iA-iC) × R28 × 11

C25 and C26 are necessary to prevent leakage of the EFM component into the tracking error output.

The gain setting makes R28 = R29 + VR5 = 150kohms and C25 = C26 = 47pF. Here, fc = 22.6kHz.

R29 + VR5 includes adjustment VR. This is tracking error balance for the purpose of obtaining a DC balanced tracking error signal such as the one shown in Fig. 7-17. It is needed primarily to perform tracking jump properly. The output of pin 17 is a 4V p-p tracking error signal.

④ Focus OK circuit

The focus OK circuit makes the timing window for switching on the focus servo from the focus search mode.

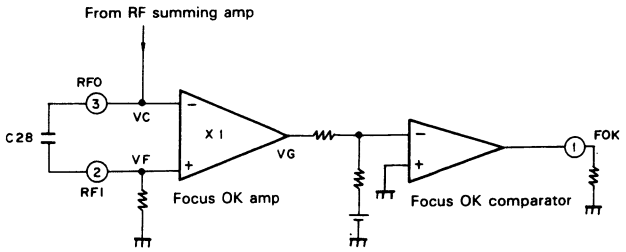


Fig. 7-13 Focus OK circuit

The threshold value VTH of the focus OK comparator is set so that it is reversed when VG = − 0.4V. Therefore the focus OK comparator is reversed when VRFO = VC = 0.4V. The threshold value of this comparator is stable due to the accuracy of the reference voltage within the IC.

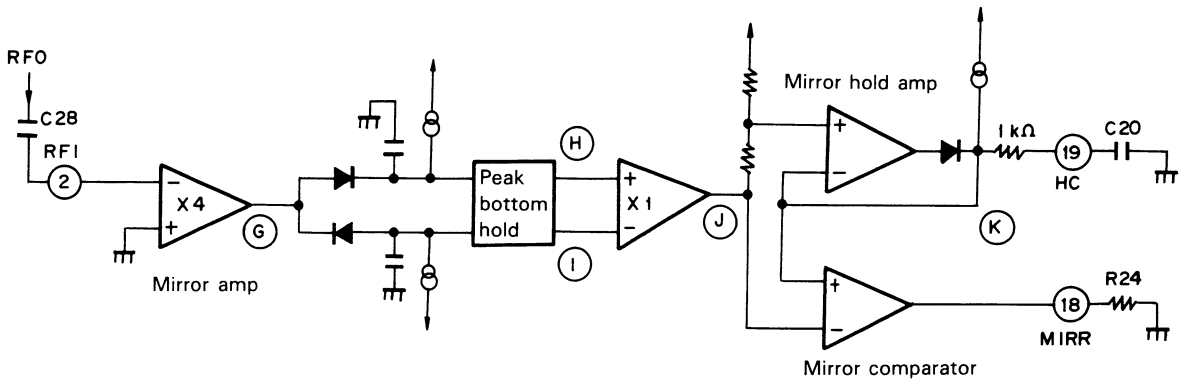
C28 determines the time constants for the EFM comparator, mirror circuit high-pass filter and focus OK amp low-pass filter. This makes it possible to prevent the worsening of the black error rate caused by the RF envelope loss when scratches and other disc damage is encountered.

In this system, 0.0047μF is used as the optimum value for C28. It is fc = 3.4 kHz for this value.

⑤ Mirror circuit

After amplifying the RFI signal, peak and bottom hold are performed. For peak hold, the time constant is such that the 30kHz traverse can also be followed. For bottom hold, the time constant is such that the rotation cycle envelope fluctuations can be followed.

The DC restored envelope signal is obtained by performing differential amplification of these peak/bottom hold signals Ⓗ and Ⓘ. By comparing this signal Ⓙ with the signal Ⓚ held by peak hold at 2/3 of the peak level using the large time constant, the mirror output is obtained. In other words, mirror output is "L" when over a track and "H" when between tracks. Furthermore, "H" is also output when a defect is detected. The time constant for mirror hold must be sufficiently larger than the traverse signal.



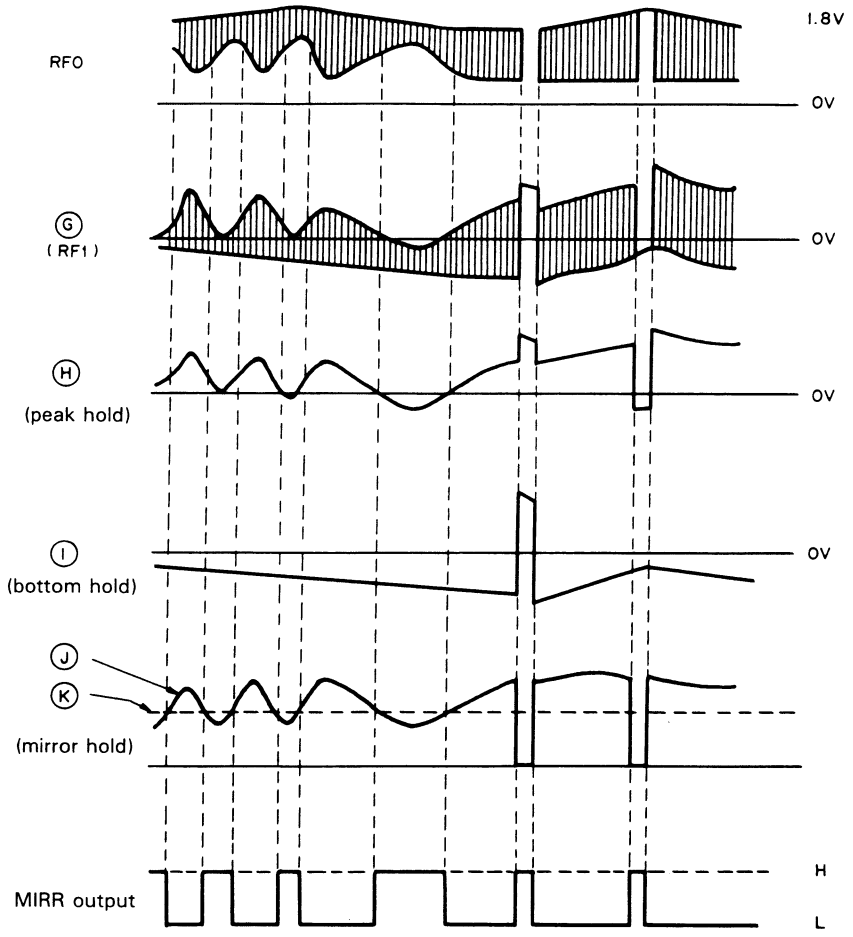


Fig.7-14 Mirror circuit

⑥ EFM comparator

The EFM comparator serves to convert the RF signal into a signal having two values. Problems caused by disc asymmetry cannot be dealt with by AC linkage alone. Therefore, the EFM comparator reference voltage is controlled by using the fact that a 1.0 occurrence probability becomes 50% for each of the two EFM signals.

Because this EFM comparator is a current switch type unit, the H and L levels do not become the same as that of the power supply voltage. It is, therefore, necessary to apply feedback through a CMOS buffer. R25, R90, C22 and C60 are the low-pass filter needed to obtain DC +2.5V. If fc is 500Hz or more, leakage of the reduced component of EFM becomes serious, resulting in a worsening of the block error rate. This system has two stages, one in which R25 = 100kohms and C22 = 0.47μF so that fc = 3.4Hz and a second in which R90 = 10kohms and C60 = 0.01μF so that fc = 1.6kHz.

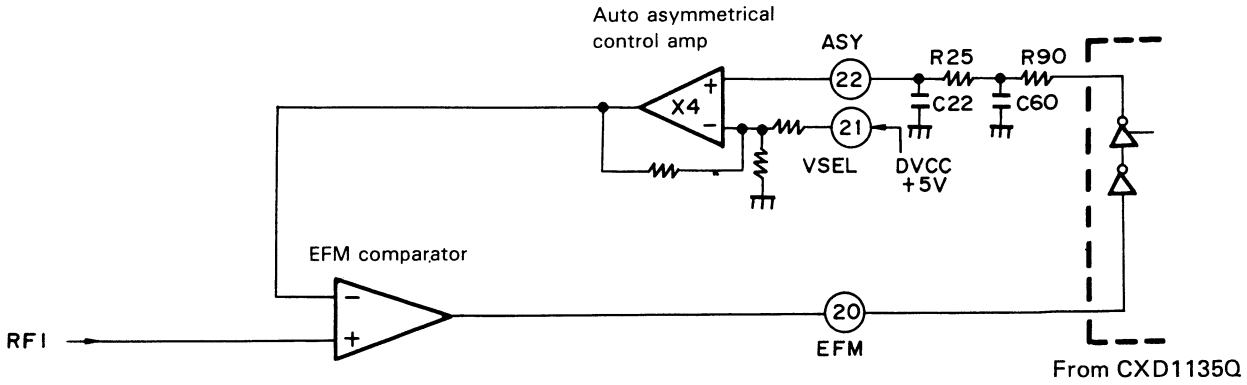


Fig. 7-15 EFM comparator circuit

7.2.2. Servo Section

This section uses an external control signal for focus servo, tracking servo and carriage servo operation (normal servo operation) and special servo control operation such as focusing and track jump. Its primary component is an IC CX20108 chip. To improve servo performance with regard to disc scratches and other disc defects, a discrete defect correction circuit is included.

The IC is a 30-pin flat package having a construction as shown in Fig. 7-16. A description of each section follows. The operation modes and data of this IC are shown in Table 7-1.

COMMAND	ADDRESS D7 D6 D5 D4	DATA D3	D2	D1	D0	SENSE
FOCUS CONTROL	0 0 0 0	FS4 FOCUS ON	FS3 GAIN DOWN	FS2 SEARCH ON	FS1 SEARCH UP	FZC
TRACKING CONTROL	0 0 0 1	ANTI SHOCK	BREAK ON	TG2 GAIN	TG1 SET *	AS
TRACKING MODE	0 0 1 0	TRACKING * MODE		SLED * MODE		TZC

TRACKING MODE	D3	D2
OFF	0	0
ON	0	1
FWD JUMP	1	0
REV JUMP	1	1

SLED MODE	D1	D0
OFF	0	0
ON	0	1
FWD MOVE	1	0
REV MOVE	1	1

Table 7-1

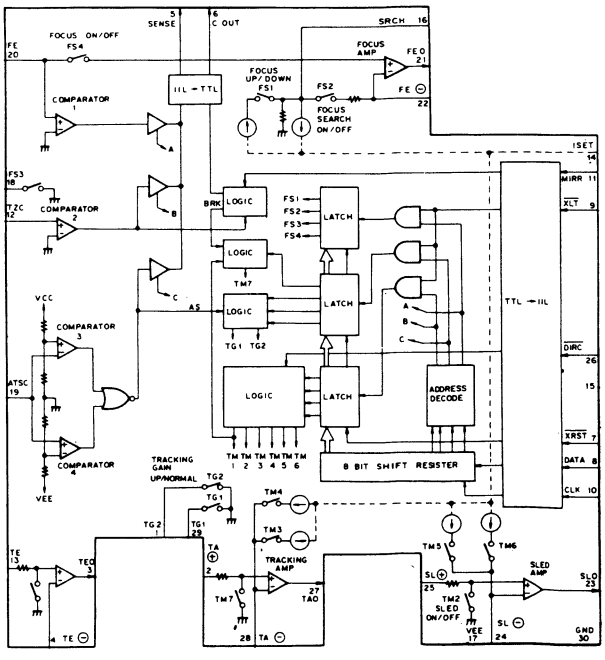


Fig. 7-16

① Command Codes

The modes of both IC CX20108 and the demodulator IC CXD1135Q, which will be discussed later, are controlled by the serial data (from the control microcomputer). All types of detection outputs are output from the "SENS" terminal. These control data and detection outputs link the control microcomputer, CX20108 and CXD1135Q in the form of a control bus line. The DATA, CLK (serial) for mode control and XLT timing for starting execution are shown in figure 7-17.

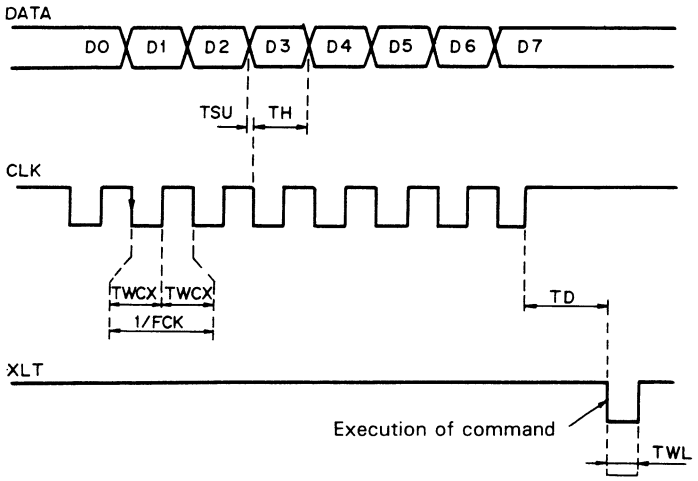


Fig. 7-17

Item	Code	Standard			Unit
		Min.	Std.	Max.	
Clock frequency	FCK			250	kHz
Clock pulse width	TWCK	2			μS
Set-up time	TSU	-0.1			μS
Hold time	TH	4			μS
Delay time	TD	4			μS
Latch pulse width	TWL	1			μS

Table 7-2

② Focus servo system

(a) Focus-in sequence

The focusing sequence moves the lens to within the focus S-curve and closes the servo loop at the center of the S. For moving the lens up and down, the following section of the IC is used.

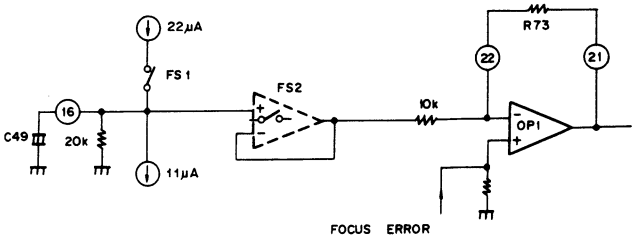


Fig. 7-18

Operation of FS1 and FS2 is as follows. The numbers shown in Fig. 7-18 (and in this section) are pin numbers of CX20108. Opl is the op amp used for the focus servo. The FS2 output is sustained at the reverse terminal. For 1, FS2 is on and operates as a normal voltage follower. For 0, FS2 becomes a switch to give this output a high impedance. FS1 is simply a current switch that is off for 1 and produces a current of 60μA for 0. The 60μA figure is the value when 240μA is sent to ISET (pin 14). The focus search voltage can, therefore, be produced by using FS1 and FS2.

In this system, 89μA is fed to ISET. That means the positive current supply is 22μA and the negative current supply is 11μA. Here, the voltage of pin 16 is:

When FS1 is off: $-11\mu A \times 20\text{kohms} = -0.22V$

When FS1 is on: $(22-11)\mu A \times 20\text{kohms} = +0.22V$

This is returned to original form and used to perform up/down lens movement. Furthermore, all current supplies for the tracking servo drive described below are 22μA.

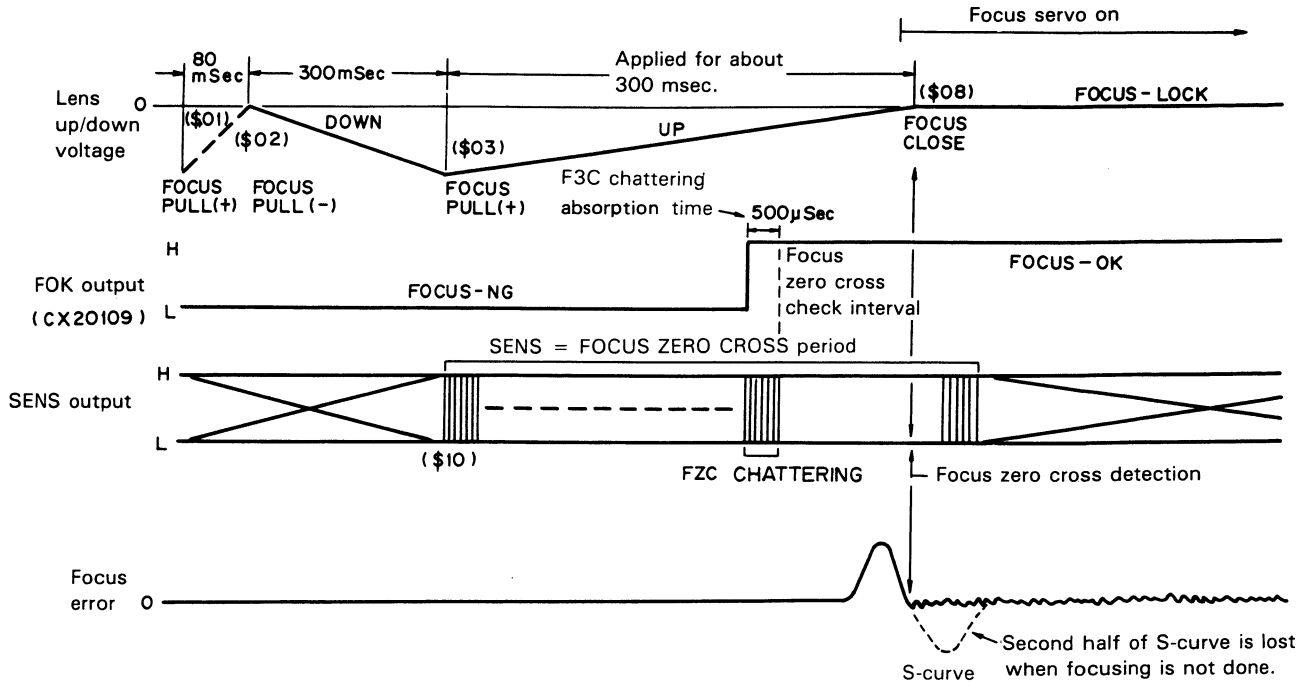


Fig. 7-19

In the sequence shown in Fig.7-19, focusing is being performed. First, for lens up/down movement, FS1 of Fig. 7-18 causes the control microcomputer to reset CX20108 when power on is reset. As a result, the internal register becomes $00, the focus mode. At this time, FS1 is on so the voltage at pin 16 is +0.22V.

Although the focusing sequence is as shown in Fig.7-19, positive charging of pin 16 when power is switched on corresponds to lens drive in the downward direction. Consequently, switching FS2 on immediately would cause the lens to move downward rapidly. To prevent this from occurring, FS1 is switched off and negative charging is performed. FS2 is then switched on to begin the drive sequence only after pin 16 has reached ground potential (approximately).

The usual sequence is as follows. The lens is lowered (max. of 1mm) and then raised. When the lens approaches the S-curve, "FOK" (the focus output based on the RF output) goes to "H", the center of the S-curve is detected using the SENS output and the servo loop is closed.

The maximum amount of lens movement in the upward direction is also 1mm (see Fig. 7-4). If focusing can not be done the first time, the lens is lowered and raised again in a second attempt to attain proper focusing. Focusing is attempted no more than two times. If proper focusing is still not possible, the unit proceeds to a processing routine.

For focus error zero cross detection in this system, a window comparator in CX20108 is used. The input for this comparator is pin 19 "ATSC". As is shown in the table, comparator output is obtained from "SENS" when in the tracking control mode. By doing this, instability occurring immediately before and after a focus error and mistaken zero cross point detection due to focus error offset are eliminated. Here, the threshold is about ±0.65V.

(b) Main loop

This loop consists of a one stage low range gain compensator, one stage high range phase compensator and two stage high-cut filter for high range noise attenuation. The main loop is designed to provide a residual error of less than — 1 μm as well as excellent playability, taking into consideration the above characteristics and disc standards (including pickup actuator characteristics).

③ Tracking servo system

(a) Brake mode circuit

The brake mode circuit is provided to make possible the smooth closing of tracking when the pickup and disc are moving in relation to each other. The directions of pickup and disc movement are detected using the phase relationship between the envelope and tracking error (at RF). Switching is conducted in such a way that the accelerating side of the tracking error is cut. Consequently, only the decelerating side is used. This operation, called the brake mode, is shown in Figs.7-20 and 7-21. External control of the activity and inactivity of this mode is possible.

The brake mode is used when closing tracking after focusing. By doing this, smooth focus closing is possible even for tracks (lines of pits) whose distance to the pickup is varying greatly due to disc eccentricity, warping and other factors.

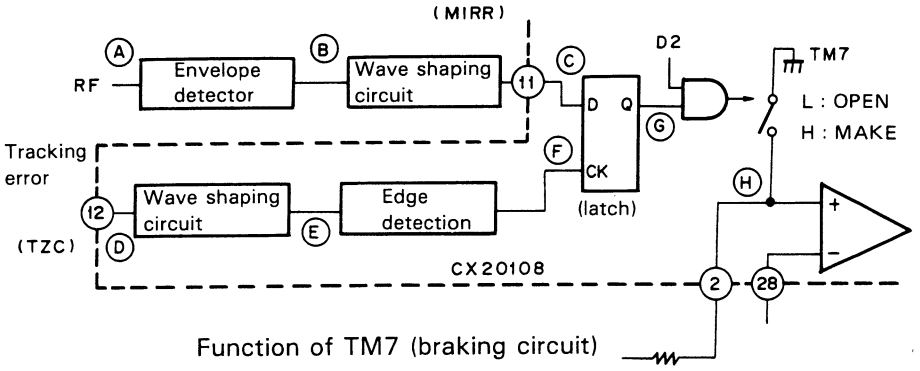
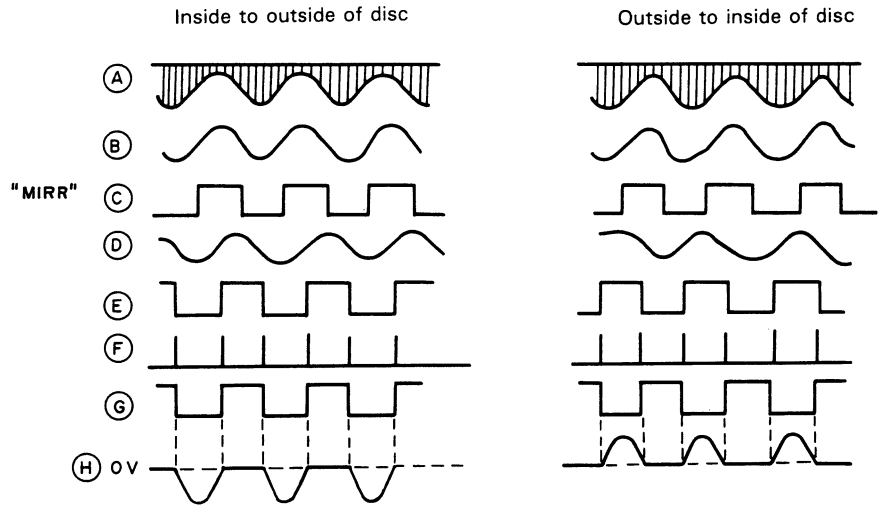


Fig. 7-20



(external waveform)

Description of Fig.7-20

Fig. 7-21

(b) Main loop

There are two gain settings for normal disc play, the normal gain setting and the higher gain setting for track jump. The main loop consists of a one stage fixed low range gain compensator, one stage switching reduced gain compensator, one stage fixed high range phase compensator, one stage switching high range phase compensator and two stage high range noise cut filter. The necessary characteristics can be obtained by switching simultaneously the two switching stages section.

As shown in the diagram, there are two low range and two high range stages at the normal gain setting and two low range and one high range stage at the high gain setting. Fig. 7-22 shows the circuit configuration of this section. For normal gain, both TG1 and TG2 are on; for the high gain, both TG1 and TG2 are off.

The drive current supply is, as is shown previously, 22μA. Therefore, in this system the output voltage of pin 27 is the voltage obtained when this current is applied to the resistance between pins 28 and 27 (9.1kohms). In this case, the output voltage is 200mV. This becomes the kick and brake drive voltage (the output voltage of pin 27). This output voltage is then used for current drive of the tracking actuator in the final driver.

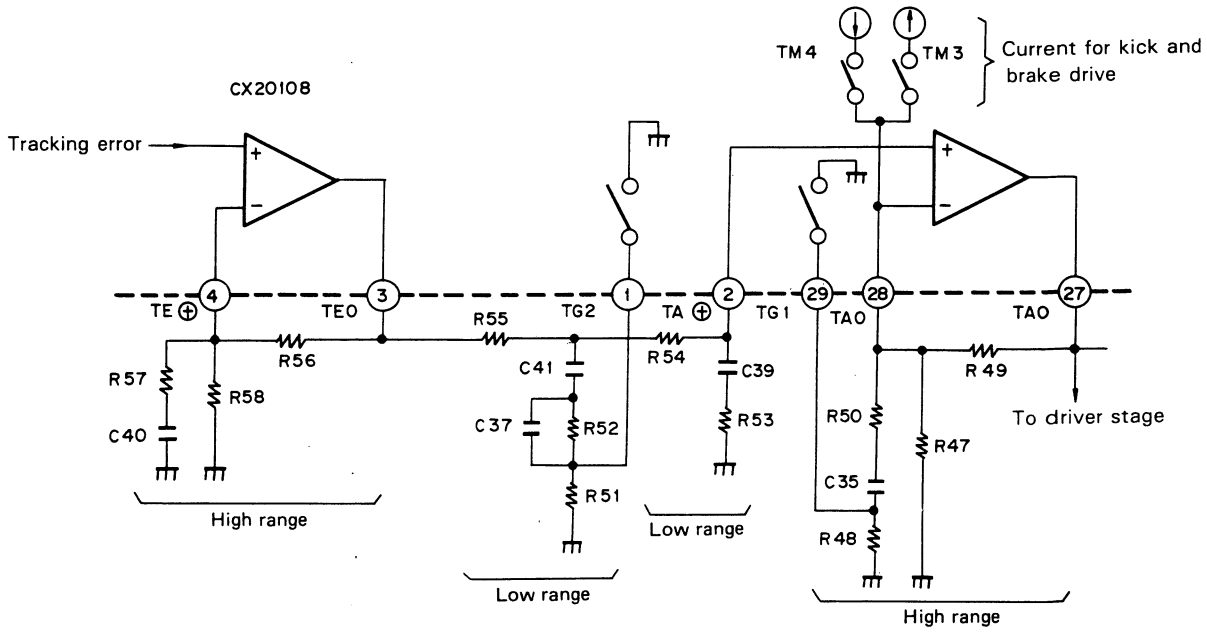


Fig. 7-22

④ Carriage servo system

The return resistance voltage of the tracking actuator current driver final stage is used as the input (see Fig. 7-23). The required carriage movement components are obtained by using the filter characteristics.

The carriage movement drive is performed by controlling the current supply in CX20108 with the serial data so that the output is a DC voltage. Because this type of

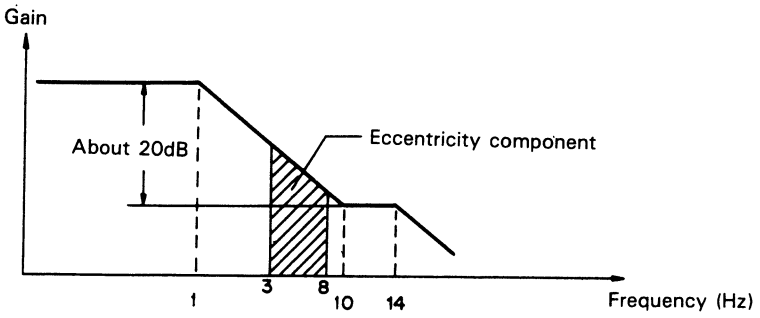


Fig. 7-23

carriage drive system is used, the final stage employs voltage drive. The power supply is unregulated, so the drive voltage is also unregulated when carriage movement is started. Due to the gain setting, the movement drive is limited at about ±13V. Consequently, motor drive becomes a DC voltage when the unregulated voltage becomes high.

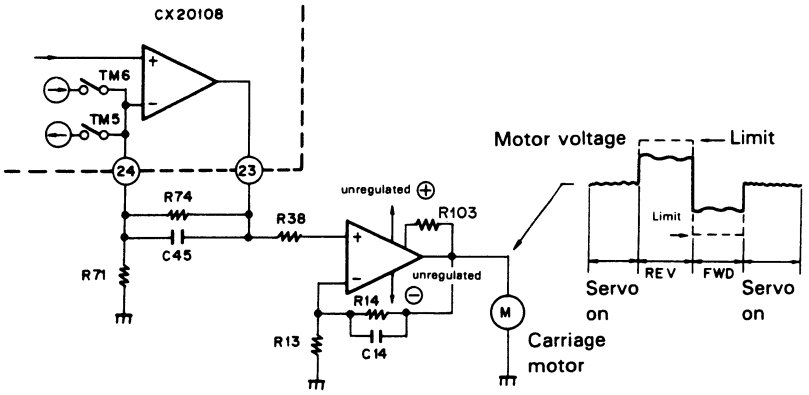


Fig. 7-24

7.2.3 Demodulator

The demodulator is composed primarily of LSI CXD1135Q; it also includes a small amount of added-on circuits. Its functions are:

1. Bit clock regeneration using the EFM-PLL circuit.
2. Demodulation of the EFM data.
3. Detection, protection and internal extension of the frame sync signal.
4. Thorough error detection and correction.
5. Interpolation using averaging or previous value hold.
6. Demodulation of the sub-code and error detection for sub-code Q.
7. CLV servo for the spindle motor.
8. 8-bit tracking counter.
9. CPU interface using the serial bus.
10. Built-in 35th digital filter.

Of these ten functions, an external circuit is required for the PLL section and CLV servo. All other functions are performed by the LSI alone. Here, the external discrete circuitry will be discussed.

The external circuitry consists of a loop filter and its amplifier and VCO.

Pin 11 "PDO" of CXD1135Q emits an output when an error is encountered. The loop filter is a low-pass filter for this output having a 70Hz pole and 1.6kHz zero point. The output is amplified by the error amp and sent to VCO. The main amplifier of VCO is within CXD1135Q.

An output signal is produced from MDP and MDS according to the CLV servo mode of CXD1135Q. The mixed filter section is a low-pass filter having a cut-off at about 500Hz and the loop filter is a low-pass filter having a cutoff at about 300kHz. FSW switches the mixed filter cutoff to about 20Hz with regard to the CLV servo mode. MON causes the loop filter output to become 0V; it is operated by the stop mode.

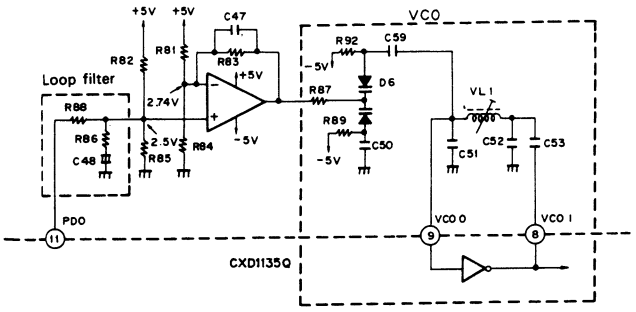


Fig. 7-25

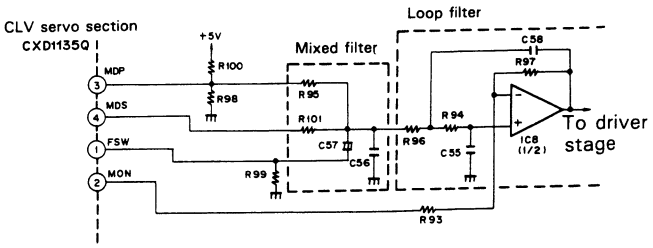
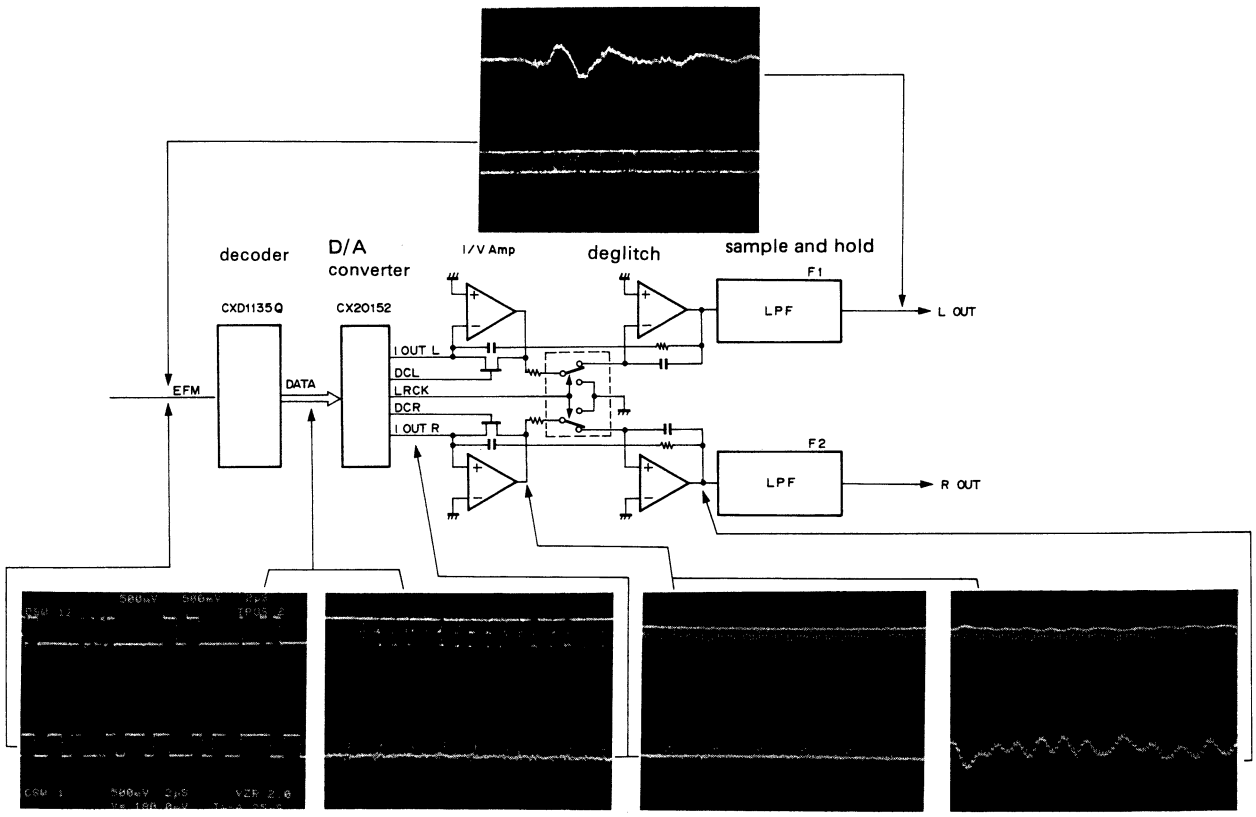
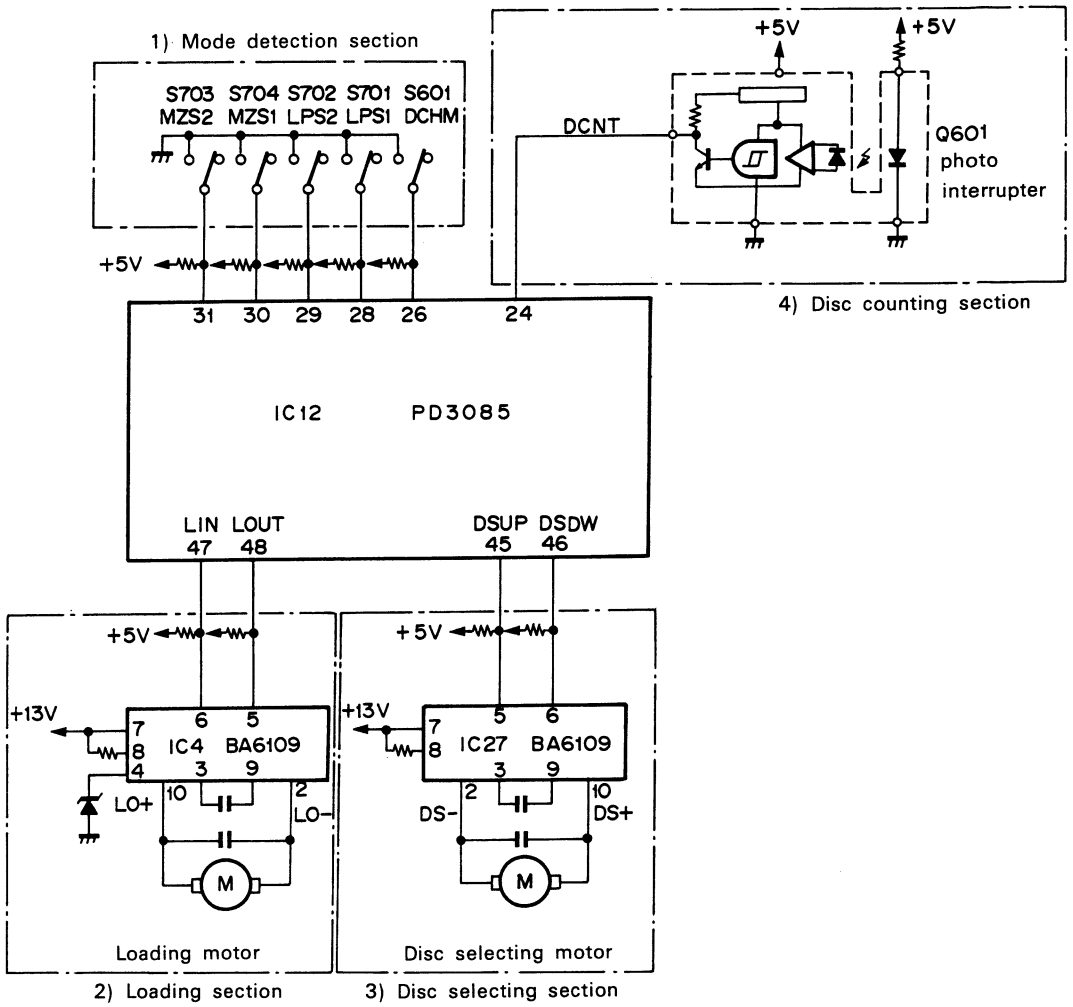


Fig. 7-26

7.2.4. Audio Section



7.2.5. MECHANICAL CONTROL SECTION



The mechanical control section consists of the following four blocks.

① Mode Detection Section

The block which detects the mode from the respective SWs and introduces to the input port of the system control microcomputer IC12.

MZS1
MZS2 } Existence Non-existence of magazine and detection of kinds

H	L	L
L	H	L
Magazine is non-existent	6-sheet magazine	1-sheet magazine

LPS1
LPS2 } Loading mode detection

H	L	L	H
H	H	L	L
STOP	During loading	Clamp mode	During ejection

DCHM
Home detection of disc selection mechanism

H	L
Home position	Others

② Loading Section

The loading motor performs the following operations:
① Pulls out an arbitrary tray from the magazine and sets the disc to clamp mode.
② Restores the disc, which has been in the clamp mode, to the tray and stores in the magazine.
③ Ejects the magazine from the main body.

① is performed by turning the loading motor normally. ② and ③ are performed by turning the loading motor reversely. This operation is to receive the binary of logic, which is output from pins 44 and 45 of the system control microcomputer IC12, and to output the motor control voltage from the output pin of IC4.

	Motor normal rotation	Motor reverse rotation	Stop
L IN IC12 44PIN	H	L	H
L OUT IC12 45PIN	L	H	H
LOAD+IC4 10PIN	+Vcc	L	L
LOAD−IC4 2PIN	L	+Vcc	L

+Vcc: Motor control voltage

Operation 1 becomes completed when LPS2 becomes "L" from "H" (clamp mode).
Operation 2 becomes completed when LPS1 becomes "H" → "L" → "H" (loading home position).
Operation 3 becomes completed when LPS2 becomes "H" by rotating the loading motor normally after rotating it reversely until it becomes "H" at MZS1 and becomes "L" at MZS2.

③ Disc Selection Section

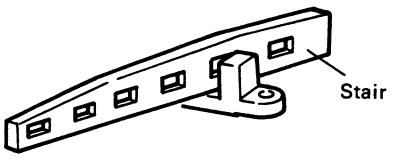
It consists of the disc selecting motor, which moves the loading mechanism section and clamp mechanism section up and down by adjusting them to the tray position, in order to select an arbitrary tray from the magazine, motor driver IC27, and system control microcomputer IC12.
Assuming that the direction to operate the loading mechanism section and clamp mechanism section from the first sheet to the sixth sheet of the 6-sheet magazine is normal rotation direction and the reverse direction is the reverse rotation direction, the motor is driven with the following logic.

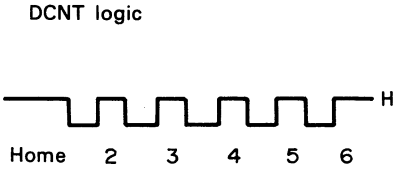
	Motor normal rotation	Motor reverse rotation	Stop
DS UP IC12 46PIN	H	L	H
DS DW IC12 47PIN	L	H	H
DS+IC27 10PIN	L	+Vcc	L
DS−IC27 2PIN	+Vcc	L	L

+Vcc: Motor control voltage

④ Disc Counting Section

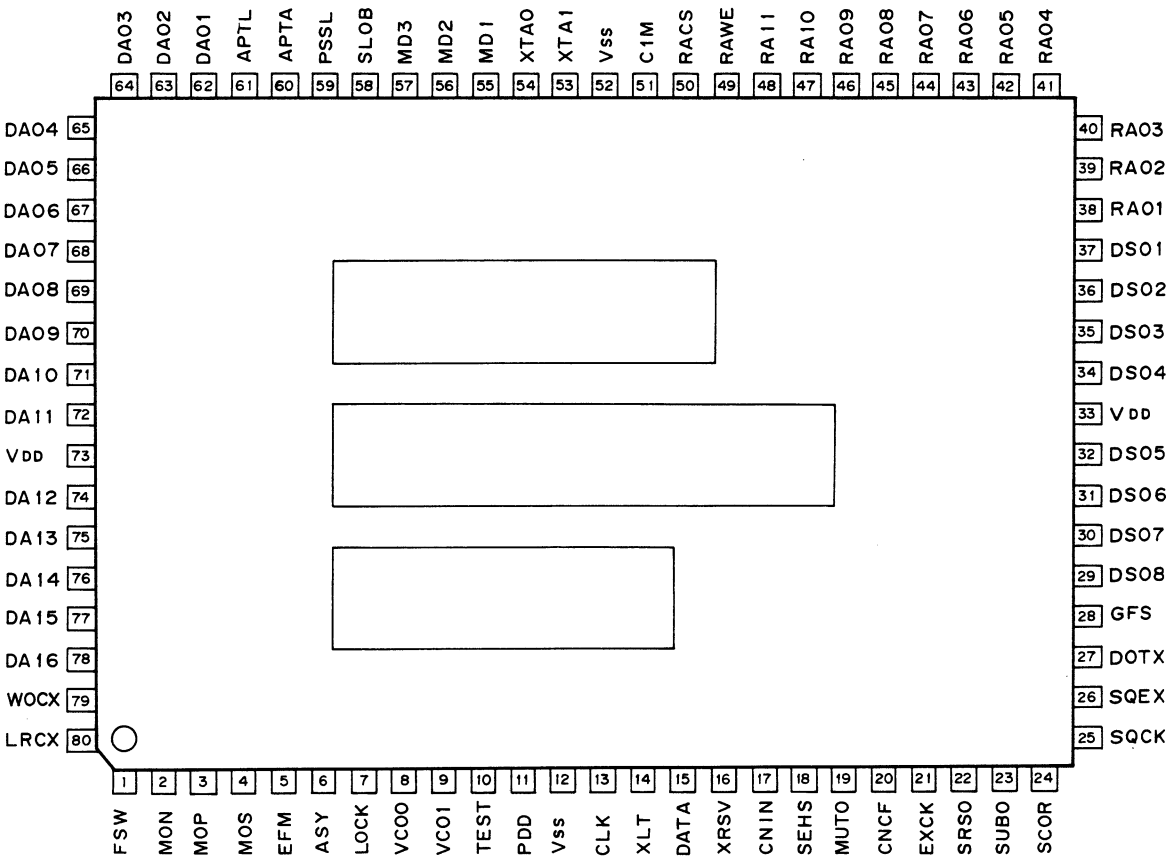
When the loading mechanical section moves up and down due to the disc selection motor, simultaneously the Q601 photo interrupter detects the positions of the first tray to sixth tray.
The tray position is detected through the windows of the stair which are provided between the photo interrupter and the slits.
When this counted number and the selected disc number are coincided, the disc selection motor is stopp





"H": Window section

7.3. IC DATA (CXD1135Q)



Pin Description

Pin No.	Pin name	I/O	Function
1	FSW	O	Output filter time constant selection output of spindle motor
2	MON	O	ON/OFF control output of spindle motor
3	MDP	O	Drive output of spindle motor. Rough control during CLV-S mode and phase control during CLV-P mode.
4	MDS	O	Drive output of spindle motor. Speed control during CLV-S mode.
5	EFM	I	EFM signal input from the RF amplifier
6	ASY	O	Output to control slice level of EMF signal
7	LOCK	O	Perform sampling with WFCK/16 of GFS signal and if it is "H", outputs "H" consecutively 8 times. If it is "L", outputs "L".
8	VCOO	O	VCO output. When it is locked to EFM signal, f=8.6436MHz.
9	VCOI	I	VCO input
10	TEST	I	(0V)
11	PDO	O	Phase comparative output of EFM signal and VCO/2
12	VSS	—	GND (0V)
13	CLK	I	Serial data transfer clock input from CPU. Latches data at rising edge of clock.
14	XLT	I	Latches input from CPU. Latches data (serial data from CPU) of 8-bit shift register to each register.
15	DATA	I	Serial data input from the CPU
16	XRST	I	System reset input. Reset during "L".
17	CNIN	I	Tracking pulse input
18	SENSE	O	Outputs internal condition corresponding to address
19	MUTG	I	Muting input. When the ATTM of the internal register is "L", normal condition with MUTG at "L" and no sound condition at "H".
20	CRCF	O	Outputs CRC checking result of sub-code Q
21	EXCK	I	Clock input for the serial output of the sub-code
22	SBSO	O	Serial output of sub-code
23	SUBQ	I	Sub-code Q output
24	SCOR	O	Sub-code SYNC S0+S1 output
25	SQCK	I/O	Reading clock of sub-code Q
26	SQEX	I	Selection input of SQCK
27			
28	GFS	O	Displays output of locked condition of frame SYNC.
29	DB08	I/O	Data pin of external RAM. DATA8 (MSB).
30	DB07	I/O	Data pin of external RAM. DATA7.
31	DB06	I/O	Data pin of external RAM. DATA6.
32	DB05	I/O	Data pin of external RAM. DATA5.
33	VDD	—	Power supply (+5V)
34	DB04	I/O	Data pin of external RAM. DATA4.
35	DB03	I/O	Data pin of external RAM. DATA3.
36	DB02	I/O	Data pin of external RAM. DATA2.
37	DB01	I/O	Data pin of external RAM. DATA1 (LSB).
38	RA01	O	Address output of external RAM. ADDR01 (LSB).
39	RA02	O	Address output of external RAM. ADDR02
40	RA03	O	Address output of external RAM. ADDR03
41	RA04	O	Address output of external RAM. ADDR04
42	RA05	O	Address output of external RAM. ADDR05
43	RA06	O	Address output of external RAM. ADDR06
44	RA07	O	Address output of external RAM. ADDR07
45	RA08	O	Address output of external RAM. ADDR08

Pin No.	Pin name	I/O	Function
46	RA09	O	Address output of external RAM. ADDR09
47	RA10	O	Address output of external RAM. ADDR10
48	RA11	O	Address output of external RAM. ADDR11 (MSB)
49	RAWE	O	Write Enable signal output to the external RAM. (Active during "L".)
50	RACS	O	Chip Select signal output to the external RAM. (Active during "L".)
51	C4M	O	1/2-divided output of crystal. f=4.2336MHz.
52	VSS	—	GND (0V)
53	XTAL	I	Crystal oscillating circuit input. f=8.4672MHz or f=16.9344MHz.
54	XTAO	O	Crystal oscillating circuit output. f=8.4672MHz or f=16.9344MHz.
55	MD1	I	Mode selection input 1
56	MD2	I	Mode selection input 2
57	MD3	I	Mode selection input 3
58	SLOB	I	Code selection input of audio data output. 2's complement output during "L" and offset binary output during "H".
59	PSSL	I	Mode selection input of audio data output. Serial output during "L" and parallel output during "H".
60	APTR	O	Aperture compensation control output. 88.2kHz during filter ON and 44.1kHz during OFF.
61	APTL	O	Aperture compensation control output. 88.2kHz during filter ON and 44.1kHz during OFF.
62	DA01	O	DA01 (LSB of parallel audio data) output when PSSL="H". C1F1 output when PSSL="L".
63	DA02	O	DA02 output when PSSL="H". C1F2 output when PSSL="L".
64	DA03	O	DA03 output when PSSL="H". C2F1 output when PSSL="L".
65	DA04	O	DA04 output when PSSL="H". C2F2 output when PSSL="L".
66	DA05	O	DA05 output when PSSL="H". C2FL output when PSSL="L".
67	DA06	O	DA06 output when PSSL="H". C2PO output when PSSL="L".
68	DA07	O	DA07 output when PSSL="H". RFCK output when PSSL="L".
69	DA08	O	DA08 output when PSSL="H". WFCK output when PSSL="L".
70	DA09	O	DA09 output when PSSL="H". PLCK output when PSSL="L".
71	DA10	O	DA10 output when PSSL="H". UGFS output when PSSL="L".
72	DA11	O	DA11 output when PSSL="H". GTOP output when PSSL="L".
73	VDD	—	Power supply (+5V)
74	DA12	O	DA12 output when PSSL="H". RAOV output when PSSL="L".
75	DA13	O	DA13 output when PSSL="H". C4LR output when PSSL="L".
76	DA14	O	DA14 output when PSSL="H". C210 output when PSSL="L".
77	DA15	O	DA15 output when PSSL="H". C210 output when PSSL="L".
78	DA16	O	DA16 (MSB of parallel audio data) output when PSSL="H". Data output when PSSL="L".
79	WDCK	O	Strobe signal output. 176.4kHz during filter ON and 88.2kHz during OFF.
80	LRCK	O	Strobe signal output. 88.2kHz during filter ON and 44.1kHz during OFF.

Pin Description (PD3085)

No.	Symbol	Name	I/O	Function
1	VSS	———		GND
2	$\overline{RES}$	———	I	CPU reset input (RESET / RUN)
3	$\overline{INT}$	WFCK	I	
4	$\overline{STBY}$	———	I	+5V (CPU standby input) (STAND-BY / RUN)
5	XTAL	———		Built-in clock circuit input
6	EXTAL	———		Built-in clock circuit input
7	NUM	———	I	GND (Use for manufacturers)
8	TIMER	Unused	I	(Connect with SENS)
9	A7	$\overline{TEST}$	I	Test mode selection input (TEST / NORMAL)
10	A6	Unused	I	GND
11	A5			
12	A4	$\overline{XLT}$	O	LSI control data executing pulse output (EXECUTE)
13	A3	SENS	I	LSI operating mode multi-mode input
14	A2	MUTG	O	Muting output (OFF / ON)
15	A1	CRCF	I	Sub-code Q-CRC checking result input (NG / OK)
16	A0	SUBQ	I	Sub-code Q data input
17	B7	SCOR	I	Sub-code sync input (SYNC)
18	B6	GFS	I	Frame sync lock input (NG / LOCK)
19	B5	FOK	I	Exact focus input (NG / OK)
20	B4			
21	B3			
22	B2			
23	B1			
24	B0	DCNT	I	Disk count pulse input (1 … 6)
25	TX(SO)	DATA	O	LSI control data serial output (0 1 2 3 4 5 6 7)
26	C6	DCHM	I	Disk selector home SW input (NOT / HOME)
27	$\overline{CK}$	CLK	O	Serial transfer clock
28	C4	LPS1	I	Loading position SW input (CLAMP / HOME)
29	C3	LPS2	I	Loading position SW input (LOAD / EJECT)
30	C2	MZS1	I	Magazine discrimination SW input (MAGAZINE IN / EJECT)
31	C1	MZS2	I	Magazine discrimination SW input (6 sheets / 1 sheet)
32	C0	$\overline{INSD}$	I	Slider inside SW input (INSIDE / NOT)
33	VCC	—	—	+5V
34	D1	KD0	I	Main unit key code input (LSB)
35	D2	KD1	I	Main unit key code input
36	D3	KD2	I	Main unit key code input
37	D4	KD3	I	Main unit key code input
38	D5	KD4	I	Main unit key code input (MSB)
39	D6	$\overline{KS}$	I	Main unit key strobe input (ON / OFF)
40	D7	STS	I	Display data transfer permission input (INHIBIT / PERMIT)
41	E0	SCK	O	Display data serial transfer clock
42	E1	SD	O	Display data serial output
43	E2	Unused	O	(Open)
44	E3	Unused	O	(Open)
45	E4	DSUP	O	Disc selection up/down output (UP / BRAKE)
46	E5	DSDW	O	Disc selection up/down output (DOWN)
47	E6	LIN	O	Disc loading in/out output (IN / BRAKE)

No.	Symbol	Name	I/O	Function
48	E7	LOUT	O	Disc loading in/out output (OUT)
49	F0	PASL	O	Pause LED output (OFF / ON)
50	F1	PLYL	O	Play LED output (OFF / ON)
51	F2	DIRC	O	Track jump direction reverse output (REVERSE / CLOSE)
52	F3	Unused	O	(Open)
53	F4	$\overline{\text{DEMP}}$	O	De-emphasis on/off (ON / OFF)
54	F5	LDON	O	Laser diode on/off output (OFF / ON)
55	F6	Unused	O	(Open)
56	F7	Unused	O	(Open)
57	G7	SRES	O	Key display microcomputer resetting output (RUN / RESET)
58	G6	$\overline{\text{RKS}}$	I	Remote control key strobe input (ON / OFF)
59	G5	RKD5	I	Remote control key code input (MSB)
60	G4	RKD4	I	Remote control key code input
61	G3	RKD3	I	Remote control key code input
62	G2	RKD2	I	Remote control key code input
63	G1	RKD1	I	Remote control key code input
64	G0	RKD0	I	Remote control key code input (LSB)

8. OPERATION CHART

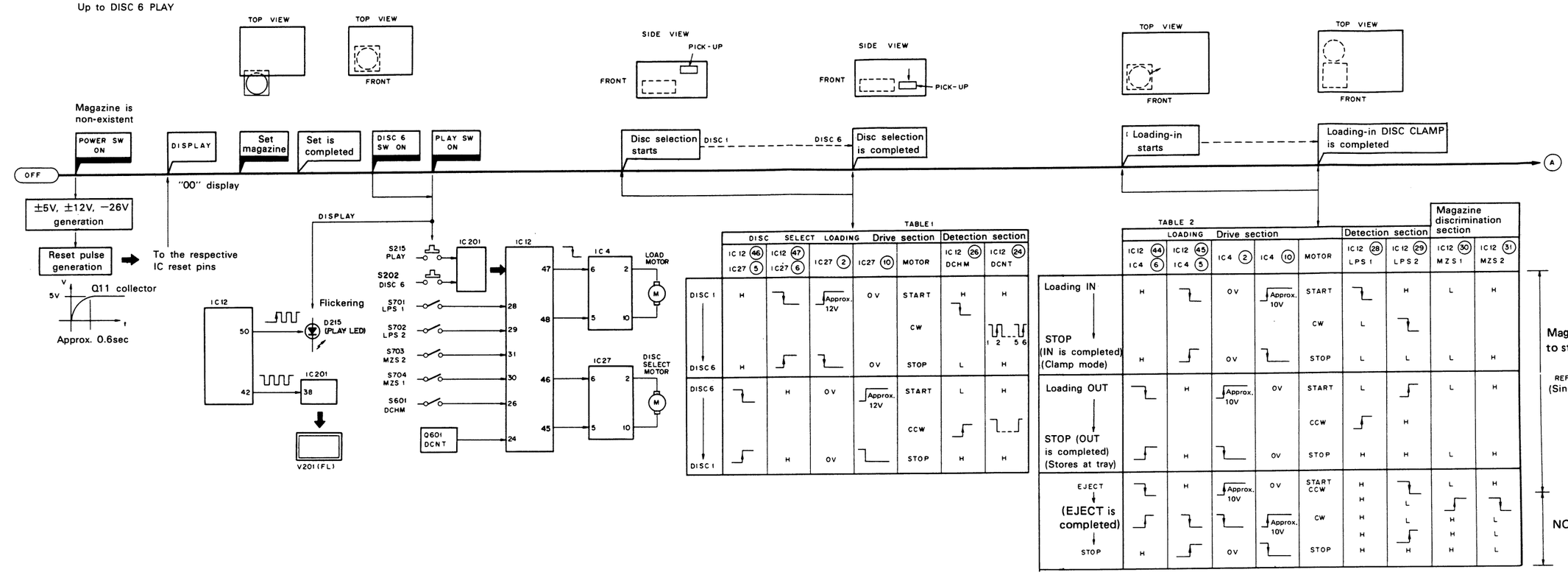


TABLE 1

	DISC SELECT LOADING			Drive section		Detection section	
	IC12 (46) IC27 (5)	IC12 (47) IC27 (6)	IC27 (2)	IC27 (10)	MOTOR	IC12 (26) DCHM	IC12 (24) DCNT
DISC 1	H		Approx. 12V	0V	START	H	H
					CW		1 2 5 6
DISC 6	H			0V	STOP	L	H
DISC 6		H	0V	Approx. 12V	START	L	H
					CCW		
DISC 1		H	0V		STOP	H	H

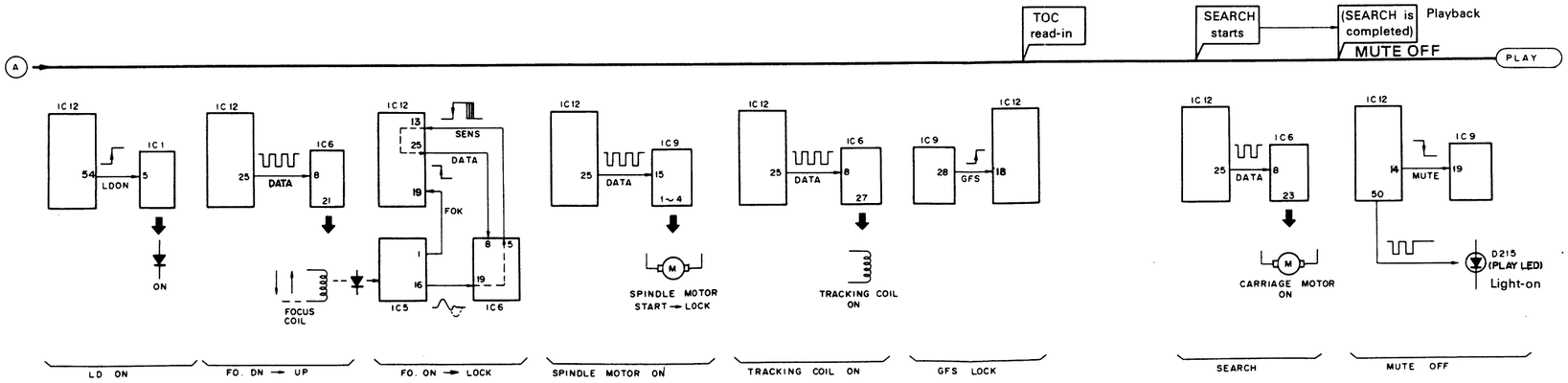
TABLE 2

	LOADING		Drive section			Detection section		Magazine discrimination section	
	IC12 (44) IC4 (6)	IC12 (45) IC4 (5)	IC4 (2)	IC4 (10)	MOTOR	IC12 (28) LPS 1	IC12 (29) LPS 2	IC12 (30) MZS 1	IC12 (31) MZS 2
Loading IN	H		0V	Approx. 10V	START		H	L	H
					CW	L			
STOP (IN is completed) (Clamp mode)	H		0V		STOP	L	L	L	H
Loading OUT		H	Approx. 10V	0V	START	L		L	H
					CCW		H		
STOP (OUT is completed) (Stores at tray)		H		0V	STOP	H	H	L	H
EJECT		H	Approx. 10V	0V	START CCW	H		L	H
(EJECT is completed)				Approx. 10V	CW	H	L	H	L
STOP	H		0V		STOP	H	H	H	L

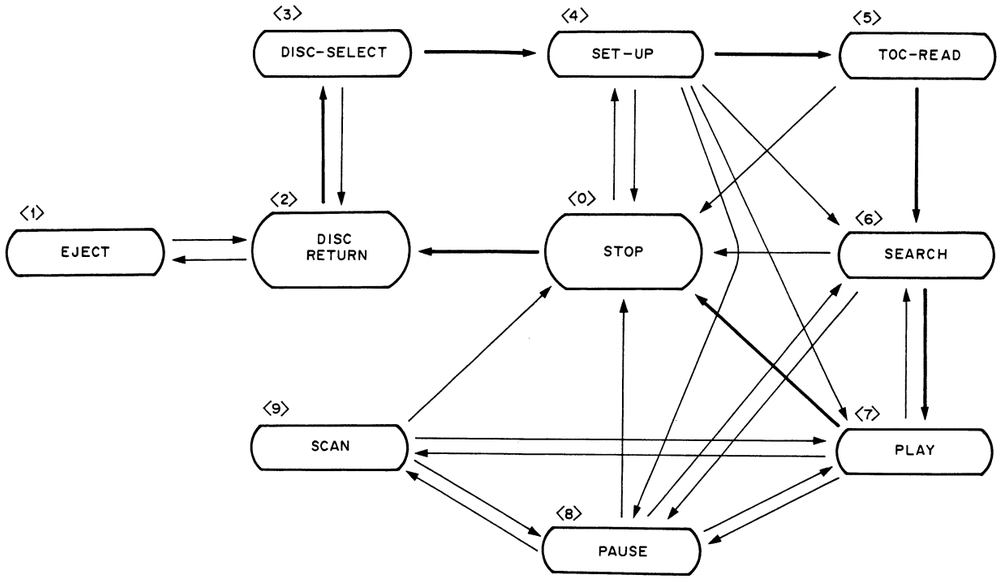
Magazine enabling to store 6 disks.

REFFERENCE (Single is MZS1 =MZS2=L)

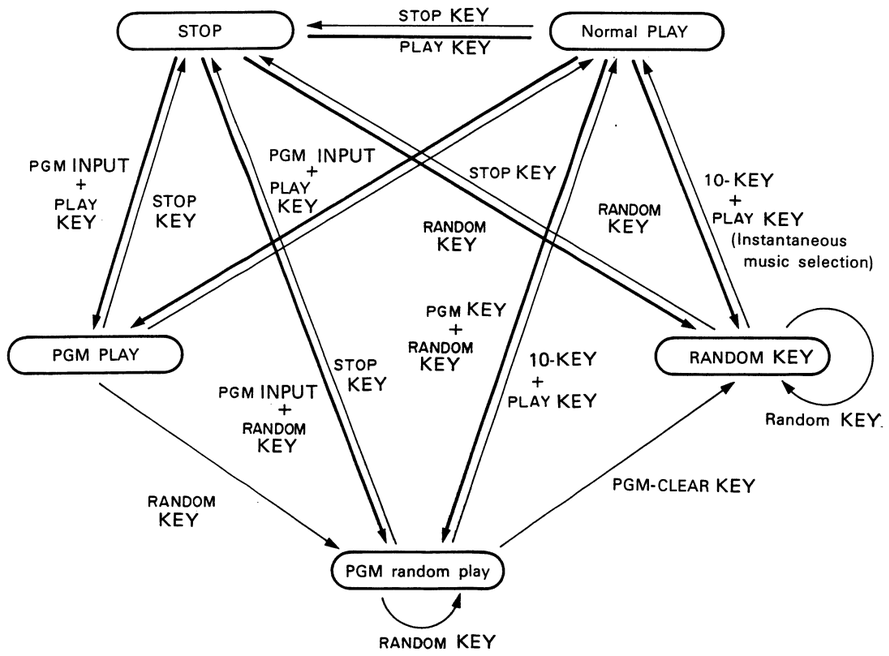
NO Magazine



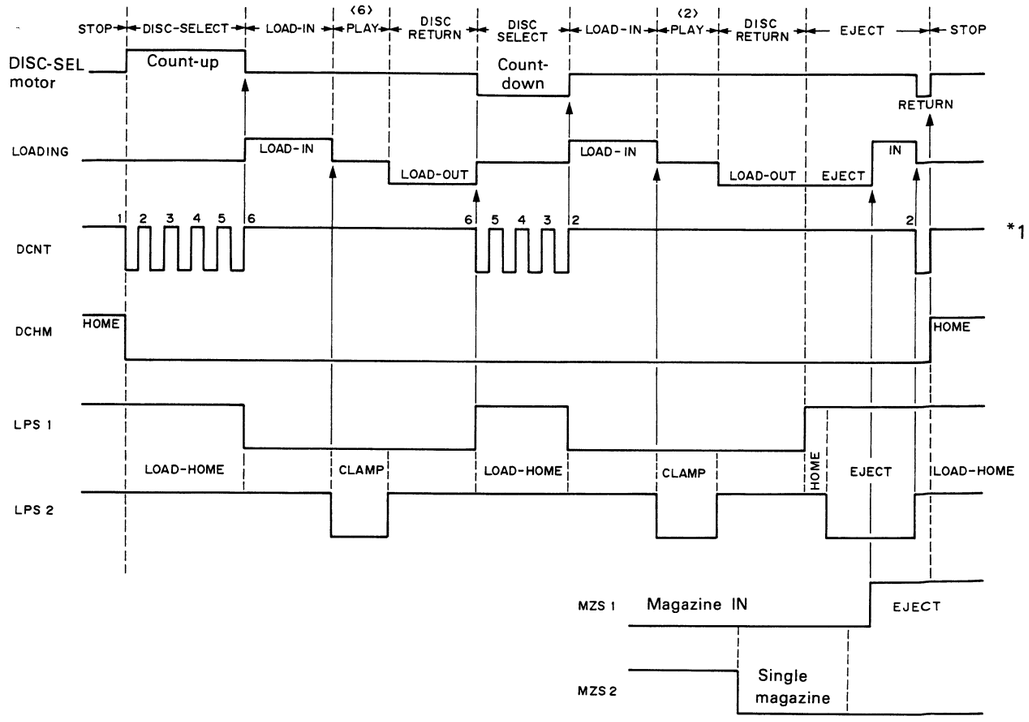
Multi-CD-Player Mode Transition Diagram



Multi-CD-Player Play Mode Transition Diagram



DISC-SELECT/RETURN/EJECT Operation Chart

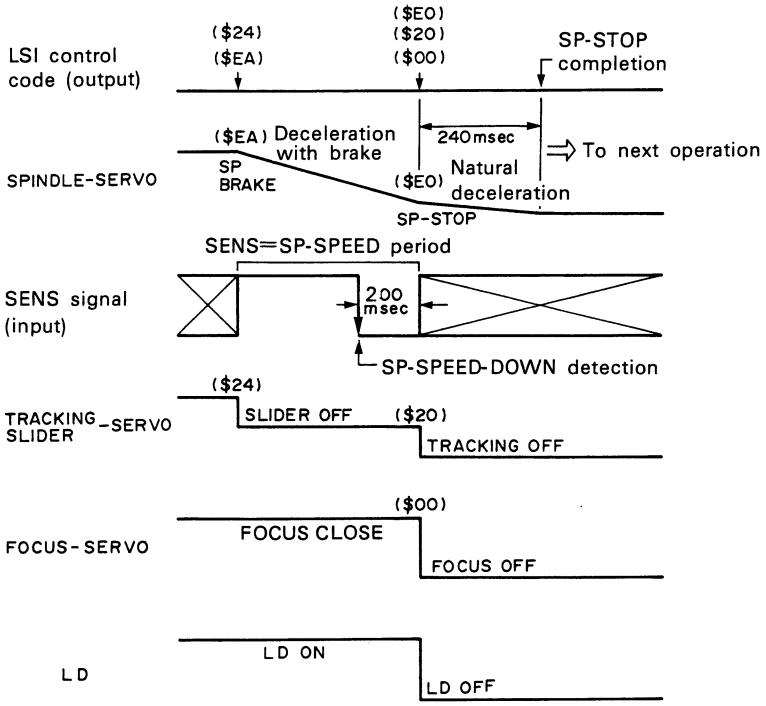


Note: MZS2 has no correlation with signals LPS1 and LPS2.

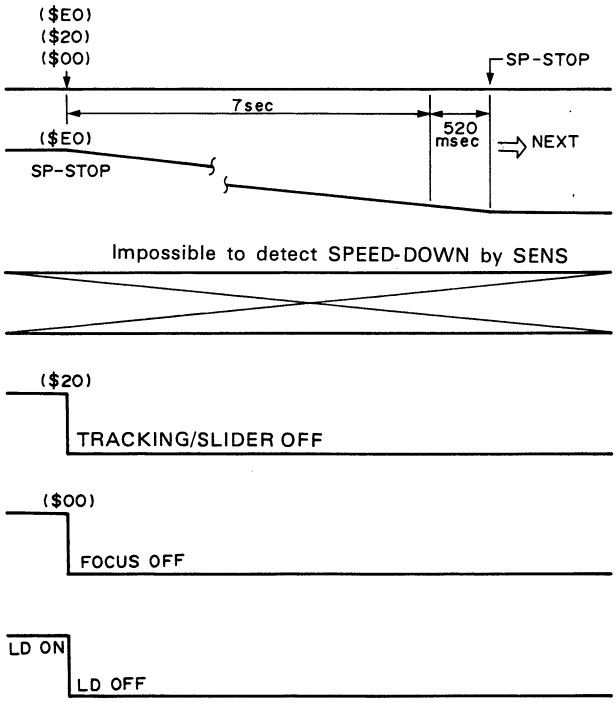
*1 : When starting count, if it is DCNT=L, recount by returning to HOME.

STOP Mode Timing Chart

(1) Normal stop (During GFS locking)

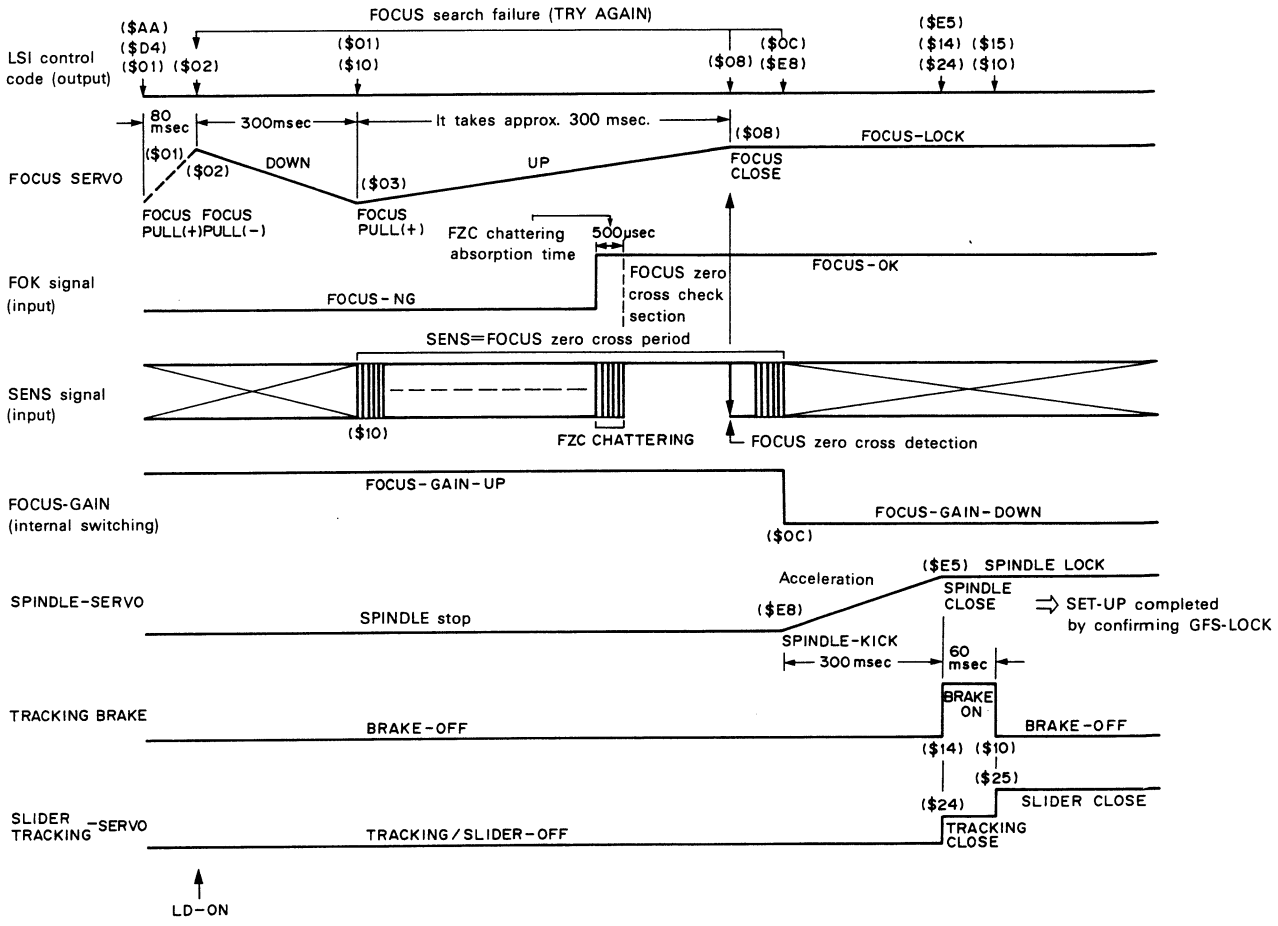


(2) Abnormal stop (GFS-NG or FOCUS deviation)



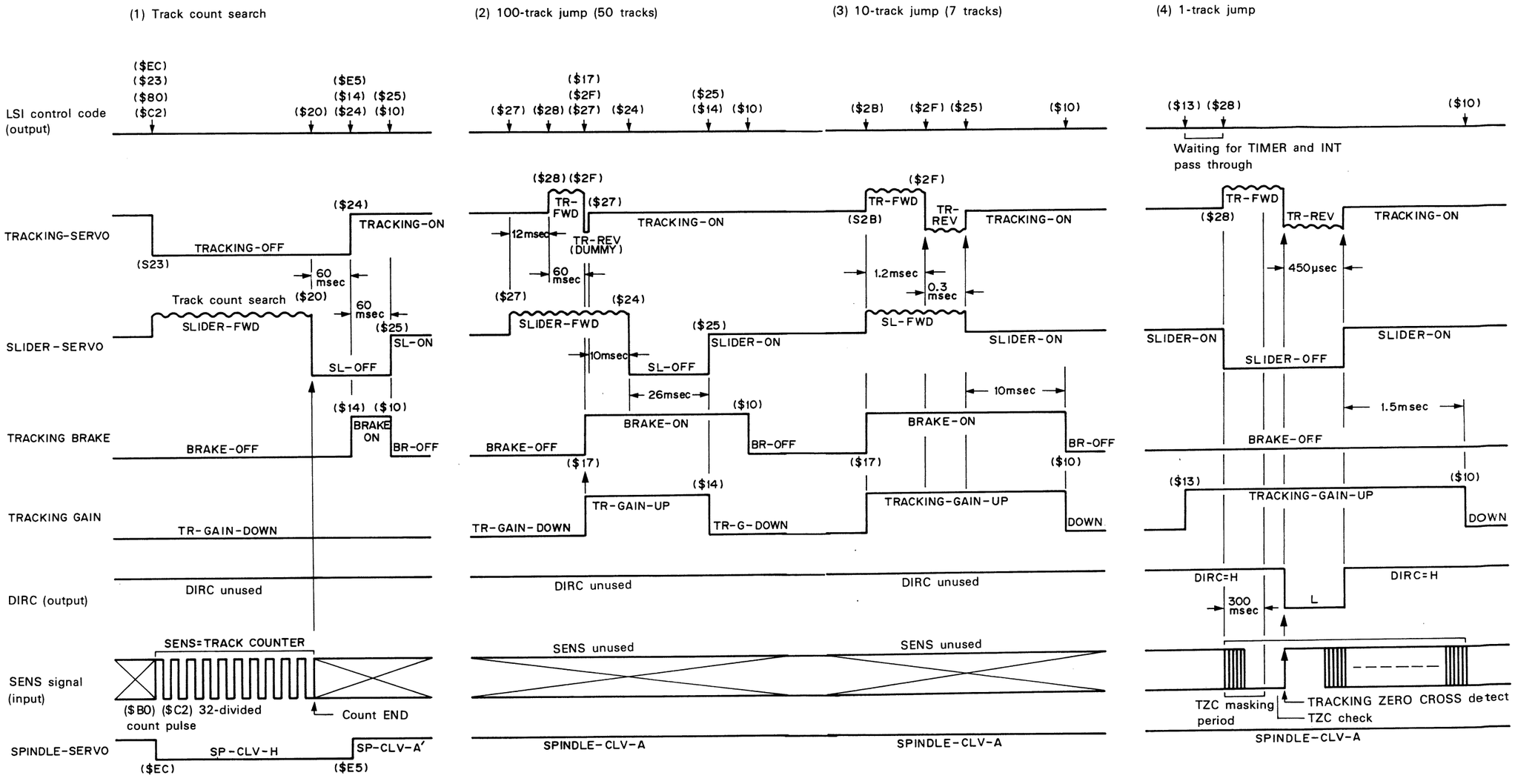
Note: * Do not confuse H/L in this timing chart with the outputs of the ports, etc. since they are written merely for technical convenience.

SET-UP Mode Timing Chart



Note: * Do not confuse H/Ls in this timing chart with the outputs of the ports, etc. since they are written merely for technical convenience sake.

SEARCH Mode Access Operation Timing Chart



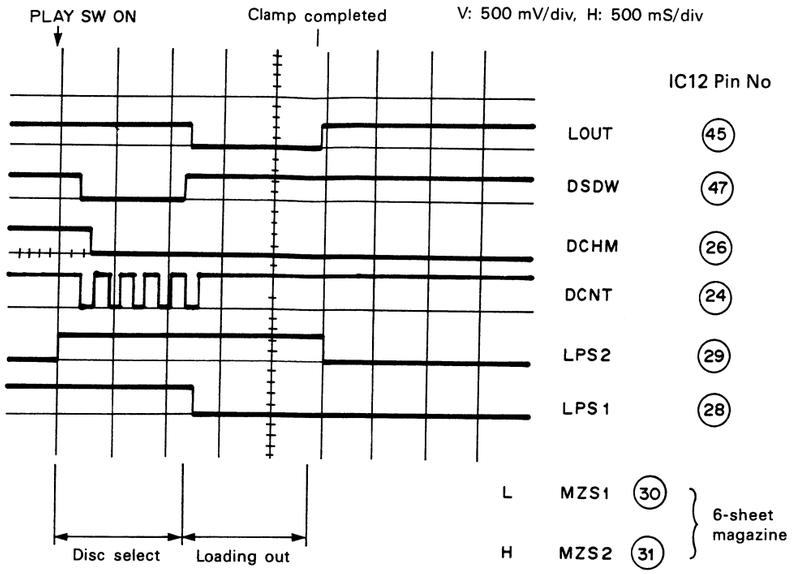
* 50 tracks/7-track jump is performed by varying the KICK time, etc. It is used in MANUAL-SEARCH.

* All the above-mentioned timings are in the case of FWD jump. In the case of the REV jump, the sending direction of section of the TRACKING/SLIDER and the polarity of the SENS input become inversed.

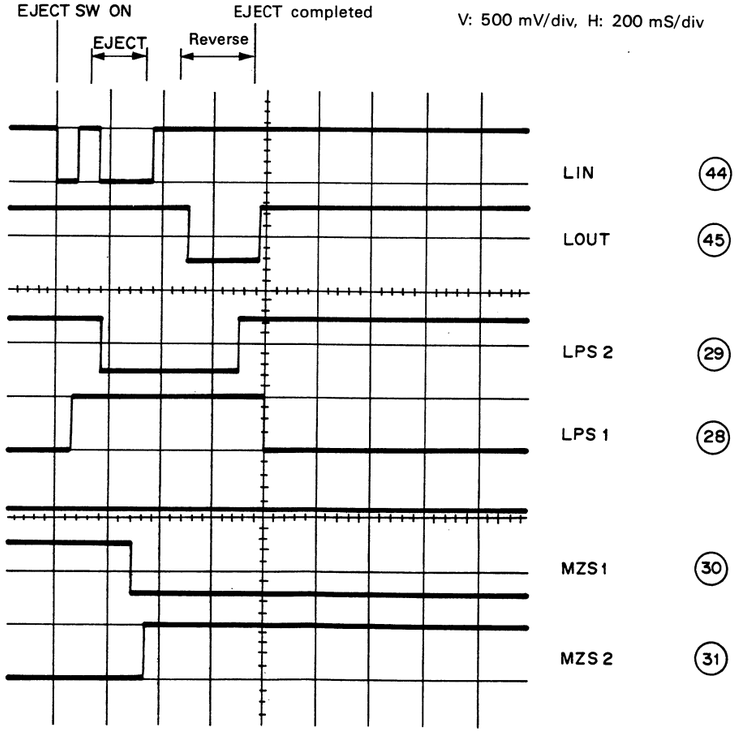
* Do not confuse H/LS in this timing chart with the outputs of the ports, etc. since they are written for technical convenience.

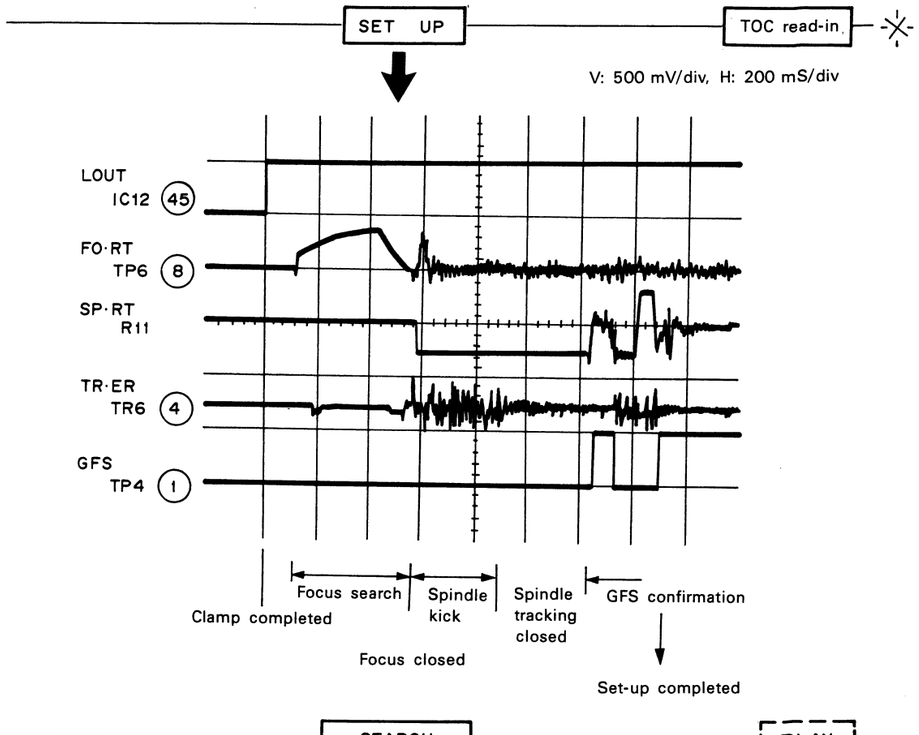
Loading
disc select

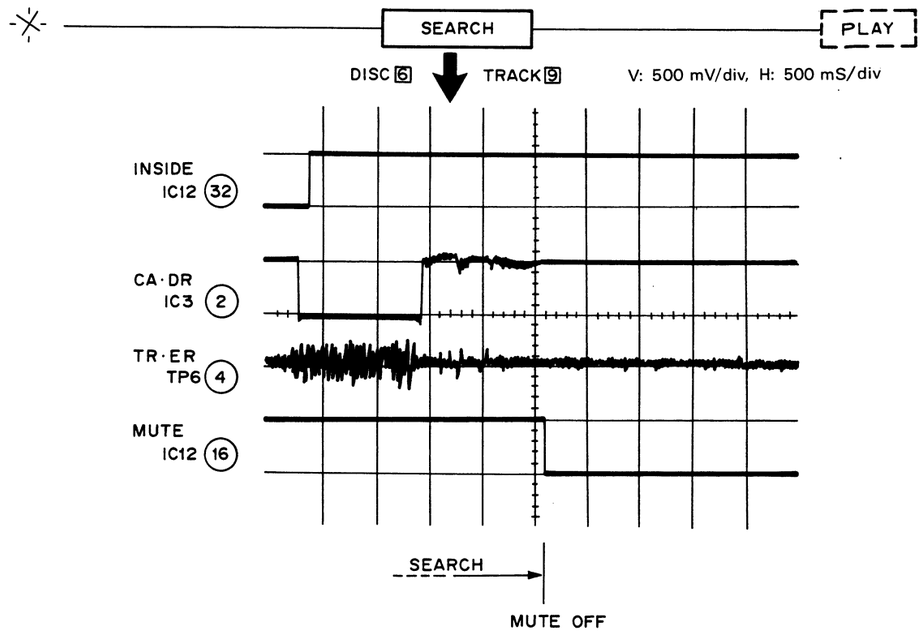
DISC 6 Play



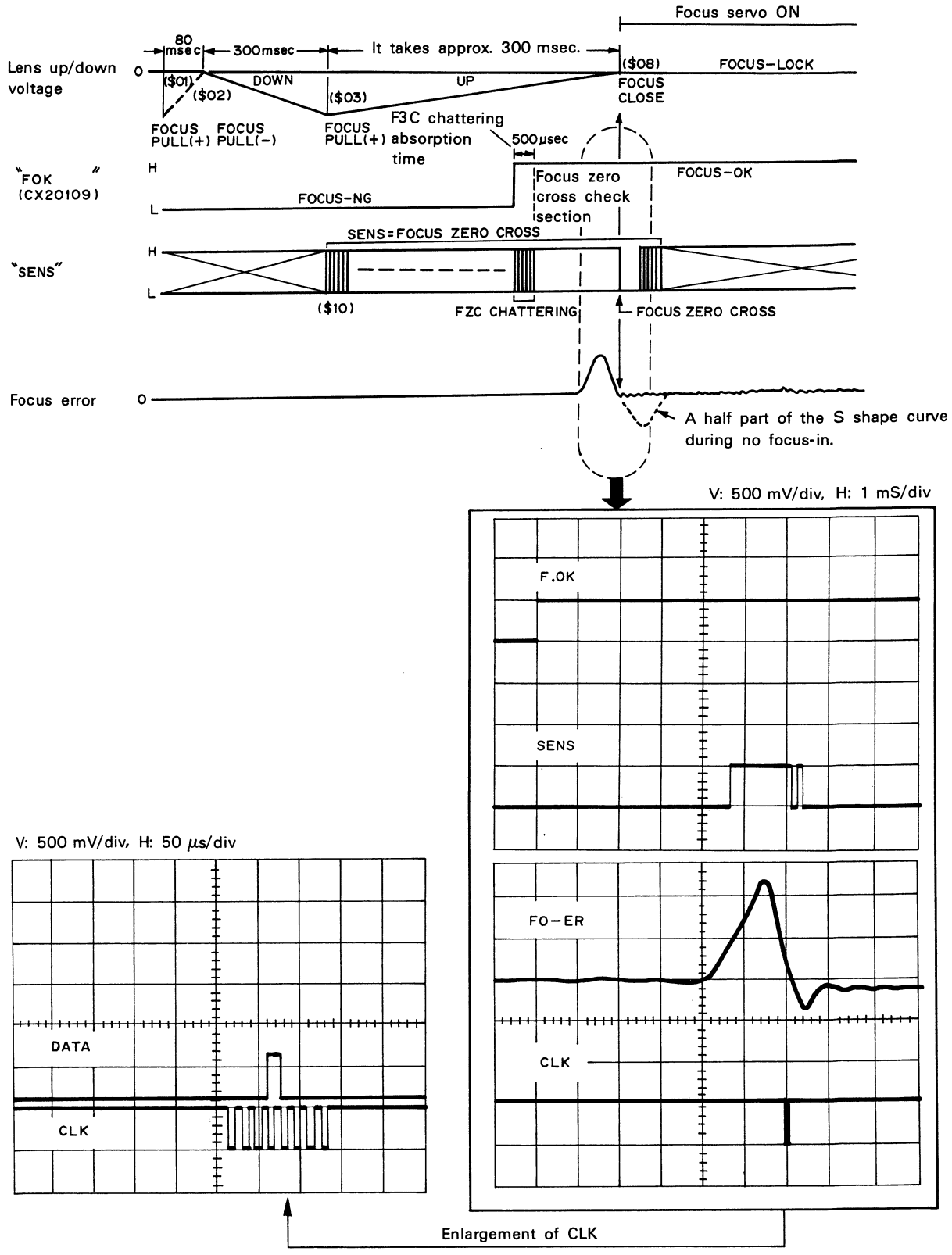
EJECT







Focus-close Routine



9. ADJUSTMENT

• Adjustment Items

1. LD (Laser Diode) output power verification
2. Tracking offset and focus offset adjustments
3. Focus lock and spindle lock verification
4. Grating adjustment
5. Tracking balance adjustment
6. Tangential adjustment
7. Focus gain adjustment
8. Tracking gain adjustment
9. VCO free-run frequency adjustment

• Measuring Equipment

1. Dual trace oscilloscope
2. Laser power meter (LPM-8000)
3. Test disc (YEDS-7)
4. AF oscillator
5. Grating driver (R-882)

• Test Mode

All the adjustments should be performed in Test Mode.

Test Mode setting and cancellation procedures

(1) To set the Test Mode, turn the POWER switch of the player (S401) ON shorting the TEST MODE TERMINALs.
(2) To cancel the Test Mode, simply turn the POWER switch of the player OFF.

The various key functions in the Test Mode are listed in Table 9-1.

• Adjusting points

VR2: Tracking offset (TR.OF)
VR3: Focus gain (FO.GA)
VR4: Tracking gain (TR.GA)
VR5: Tracking balance (TR.BL)
VR6: Focus offset (FO.OF)
VL1: VCO free-run frequency

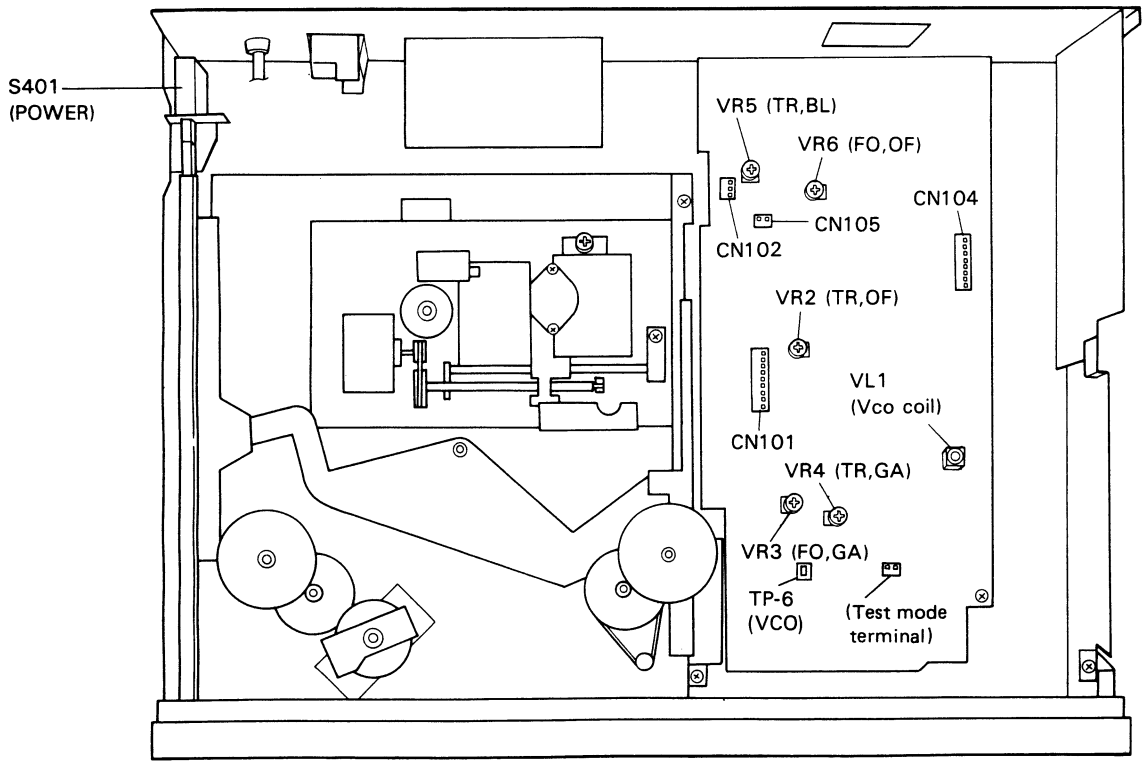
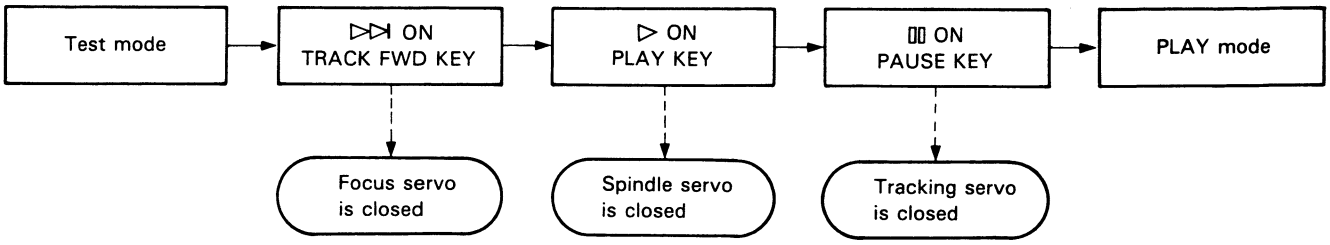


Fig. 9-1 Adjustment Points

In the Test Mode, each servo circuit can be closed and opened by separate operations. Consequently, each servo must be closed one at a time (in serial sequence) to set PLAY mode.

Note that PLAY mode is not activated by simply pressing the PAUSE key in the Test Mode.
While a disc is being selected or loaded, do not try to perform other operations.

Example: Switching from STOP to PLAY mode.



- The servo mechanisms operate in a serial sequence in the Test Mode.

• Key Functions in Test Mode

Symbol	Key	Function during test mode	Description
⏮	TRACK BACK	Laser diode turned ON.	Laser diode lights up.
⏭	TRACK FWD	Focus servo is closed.	Disc is loaded from magazine and clamped. Laser diode lights up. Actuator is moved up/down, then focus servo is closed.
▷	PLAY	Spindle servo is closed.	Spindle starts to rotate and the servo is closed when the revolution reaches the optimum speed.
▯▯	PAUSE	Tracking servo is closed/opened.	Tracking servo is closed by pressing the key once; PAUSE indicator lights up and the player is switched to PLAY mode with the elapsed time indicated on fluorescent display. Focus and spindle servos must be closed at this time. When the key is pressed again, tracking servo is opened.
◁◁	MANUAL SEARCH REV	Carriage moves in reverse direction. (towards disc center)	Carriage is moved towards disc center at a fast speed of about 1cm/sec. Since there is no safety mechanism to stop the carriage, release the key when the carriage reaches the end.
▷▷	MANUAL SEARCH FWD	Carriage moves in forward direction. (towards disc end)	Carriage is moved towards disc end at a fast speed of about 1cm/sec. Since there is no safety mechanism to stop the carriage, release the key when the carriage reaches the end.
▭	REPEAT	Lens is moved up/down.	Disc is loaded from magazine and clamped. Laser diode lights up. Actuator is moved up and down twice, then the disc is returned into magazine. Focus servo is not closed.
□	STOP	STOP	All servos are opened.
⏏	EJECT	Magazine is ejected.	Magazine is ejected. However, pickup does not return to the park position.
1-6	DISC 1-6 KEY	Disc is selected.	A disc can be selected in the six-disc system. If TRACK FWD key or REPEAT key is pressed without selecting a disc, the player automatically selects the first disc.
	TIME	All FL/LED lit	Indications circuit check

Table 9-1

NOTE:
1) The following adjustment should be performed in the Test Mode.
   Refer to page 72 to set the player in Test Mode.
2) The following adjustment except [1. LD OUTPUT POWER VERIFICATION] should be performed with a Test Disc (YEDS-7).
   Place the Test Disc recorded side up in a magazine and load the magazine in the player.
3) The description of the following adjustments starts from "STOP".

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
1	**LD (LASER DIODE) OUTPUT POWER VERIFICATION** *NOTE:* *This item can be skipped under normal service. It should be verified only when the laser power seems to be weak or the laser diode seems to be defective.*					
				VR1	0.26mW ± 0.02mW	• To verify the laser output power, the pickup has to be removed from Mechanism Chassis in the following procedure. • Turn power switch off. • Unbelt belt A. • Remove guide bar retainer. • Unhook drive screw. • Slowly lift pickup assembly upside down keeping flat cable connected. Be careful not to short the P.C. board on the pickup to chassis. • Set the player to test mode. • Place the sensor of Laser Power Meter (LPM-8000) above the objective lens. • Press TRACK REV key to turn the laser on. • Verify that the laser output power is within the specified range (0.26 ± 0.02mW). If not, adjust VR1 on the pickup to satisfy the specification. • Turn power switch off. • Reassembly the parts.
2	**TRACKING OFFSET AND FOCUS OFFSET ADJUSTMENT**					
	20mV /div	1mS /div	CN101pin9 (TR.RT)	VR2 (TR.OF)	OV ± 10mV	• Connect oscilloscope or volt meter to CN101 pin9 TR.RT (Tracking Return). Adjust VR2 TR.OF (Tracking Off-set) so that the voltage at CN101 pin9 becomes OV ± 10mV.
	20mV /div	1mS /div	CN101pin3 (FO.ER)	VR6 (FO.OF)	OV ± 10mV	• Connect oscilloscope or volt meter to CN101 pin3 FO.ER (Focus Error). Adjust VR6 FO.OF (Focus Offset) so that the voltage at CN101 pin3 becomes OV ± 10mV.

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
3	**FOCUS LOCK AND SPINDLE LOCK VERIFICATION**					
	0.2V /div	10μS /div	CN105 pin1 (RF)		RF signal is generated Counterclockwise rotation	• Press MANUAL SEARCH FWD key to move the pick-up close to the midway of the disc. Note that this step must be performed. • Connect oscilloscope to CN105 pin1 RF (RF output) and verify that an RF signal is generated when the TRACK FWD key is pressed (when the focus servo is closed). • Press PLAY key and check that the disc rotates at an optimum speed (about 300rpm on the midway of the disc) in the counterclockwise direction.
4	**GRATING ADJUSTMENT**					
	1V /div	10mS /div	CN101 pin4 (TR.ER)	Grating	NULL point (Small and smooth envelope)	• Press TRACK FWD key and PLAY key by turns to close the focus and spindle servos (leaving the tracking servo open). • Connect osilloscope to CN101 pin4 TR.ER (tracking error) through a 4kHz L.P.F. as shown in Fig. 9-2. • Insert grating driver into the adjusting hole of the pick-up as shown in Fig. 9-3. Slowly turn it and find the NULL point. (see photograph 9-1) Note: If the pickup is raised by the grating driver during the adjustment, hold the pickup down slightly.
					Maximum amplitude	• Turn the grating driver clockwise slowly from the NULL point and stop it at the point where the tracking error signal waveform first reaches the maximum. (see photograph 9-3)
	CH-1 50mV /div	X-Y mode	CH-1 CN102pin1 (BKTE)			• Connect oscilloscope CH-1 to CN102 pin1 (BKTE) and CH-2 to CN102 pin2 (FWTE). Set AC-GND-DC switch of oscilloscope to AC and mode to X-Y.
	CH-2 50mV /div AC-coupling		CH-2 CN102 pin2 (FWTE)		Straight line of 45 degrees	• While observing the Lissajous figure (see photograph 9-4), finely adjust the grating to the point where the Lissajous becomes a slender line in 45 degrees. (see photograph 9-5).

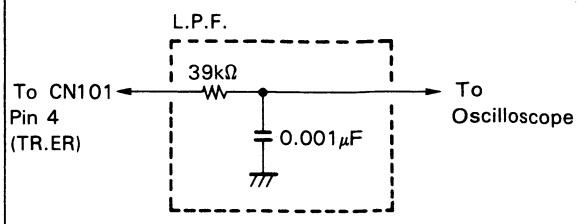


Fig. 9-2 4kHz L.P.F.

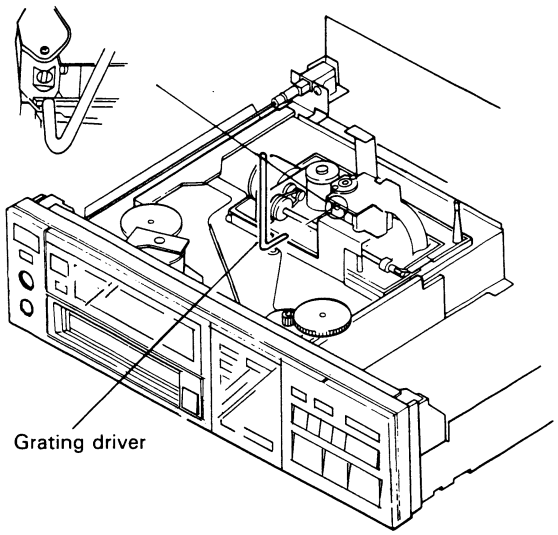
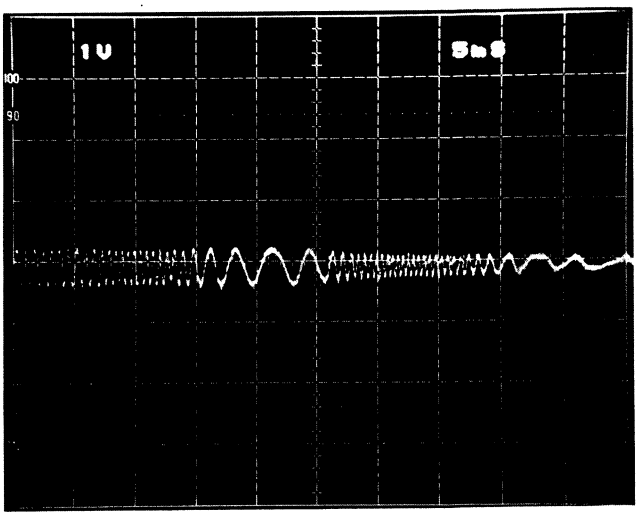
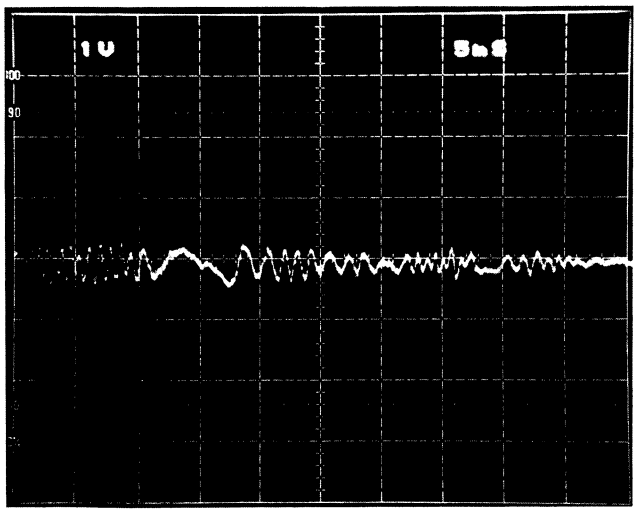


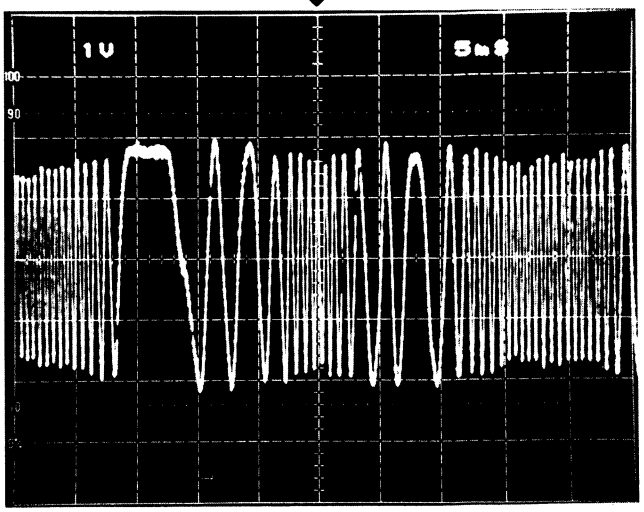
Fig. 9-3 Grating adjustment



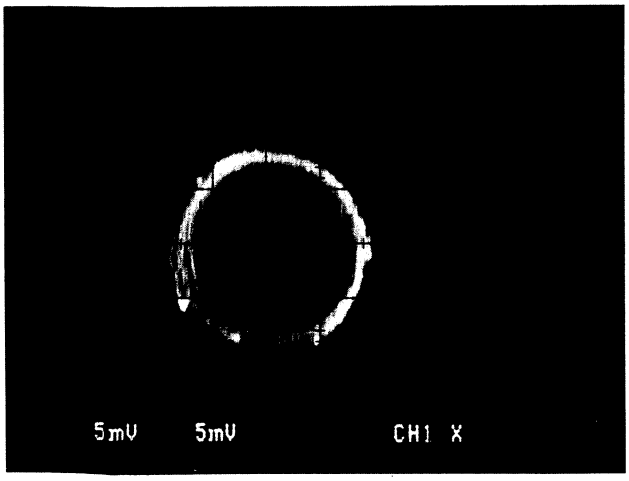
Photograph 9-1
Small and smooth envelope (NULL point)



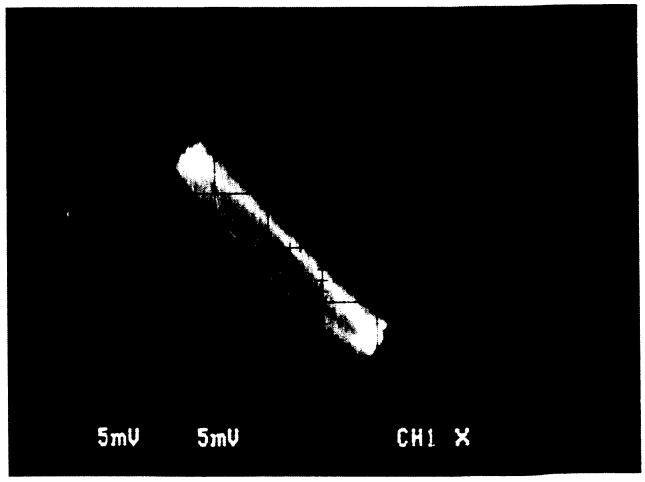
Photograph 9-2
Small but rough envelope (not NULL point)



Photograph 9-3
Maximum amplitude

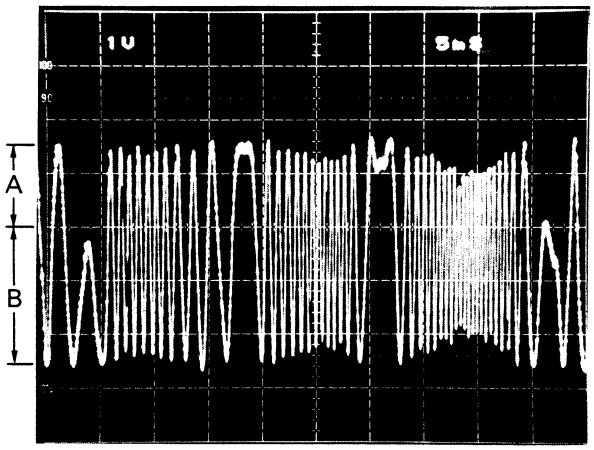


Photograph 9-4
Lissajous figures (before adjustment)

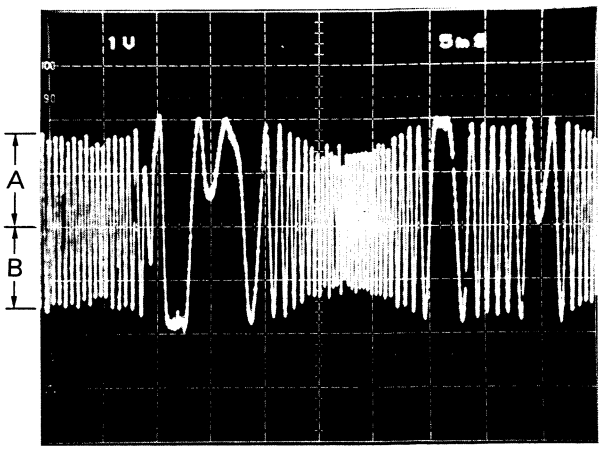


Photograph 9-5
Lissajous figures (after adjustment)

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
5	**TRACKING BALANCE ADJUSTMENT**					
	1V /div	10mS /div	CN101 pin4 (TR.ER)	VR 5 (TR.BL)	Equal positive & negative amplitude (A = B)	• Press MANUAL SEARCH FWD key to move the pick-up close to the midway of the disc. • Press TRACK FWD key and PLAY key by turns to start turning the disc. • Set GND level of oscilloscope at the center. • Connect oscilloscope to CN101 pin4 TR.ER (Tracking Error) through a L.P.F. shown in Fig. 9-2. Adjust VR5 TR.BL (Tracking Balance) so that the positive and negative amplitude of the waveform become equal as in photograph 9-7.
6	**PICKUP ANGLE ADJUSTMENT**					
	0.2V /div AC-coupling	0.2μS /div	CN105 pin1 (RF)	Pickup angle adjustment screw	Best eye pattern	• Press TRACK FWD key, PLAY key and PAUSE key by turns to close all servos. (The PAUSE indicator should be lit up) • Connect oscilloscope to CN105 pin1 RF (RF output) through a 10k-ohm resistor. Use a 5k-ohm resistor instead if the waveform is not clear. • Adjust pickup angle adjustment screw to obtain the clearest eye pattern as in photograph 9-8. The optimum point of the adjustment is in the midway between the two points from where the eye pattern starts to deteriorate when the pickup angle adjustment screw is turned clockwise or counter-clockwise.



Photograph 9-6 A < B



Photograph 9-7 A = B

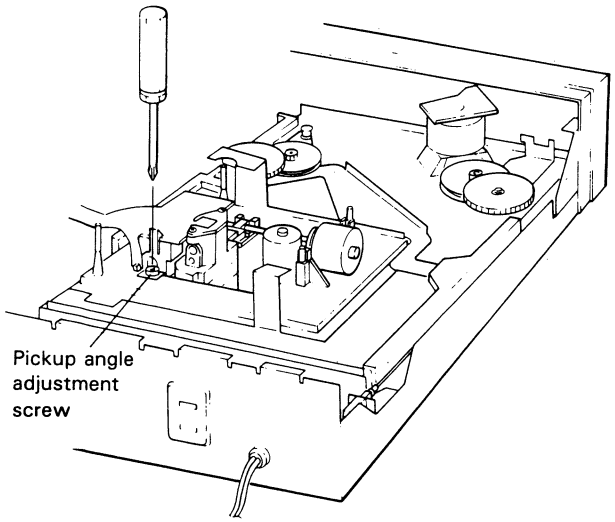
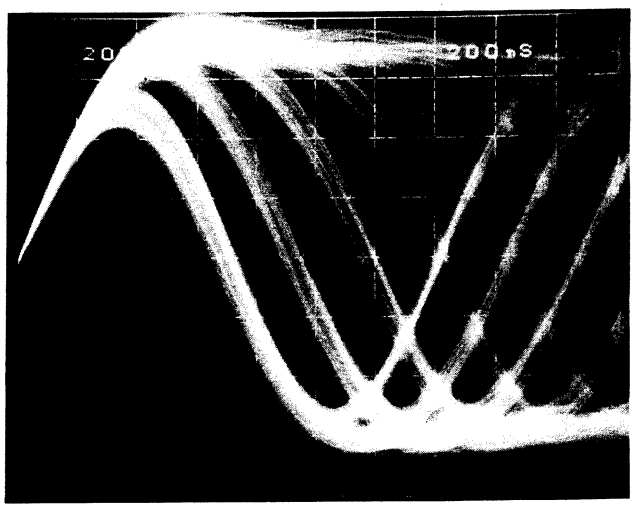
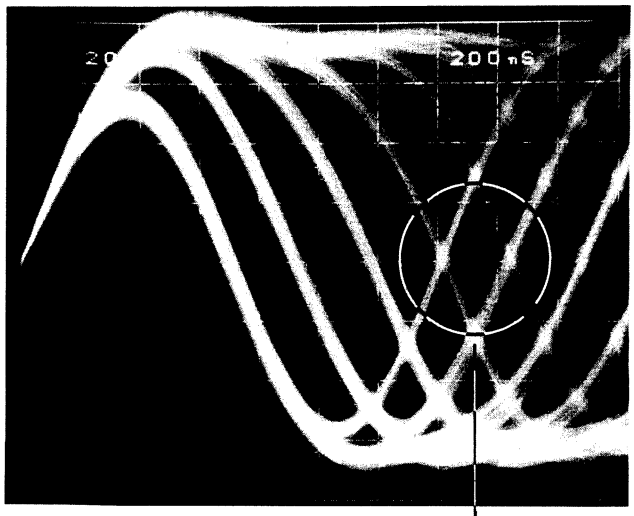
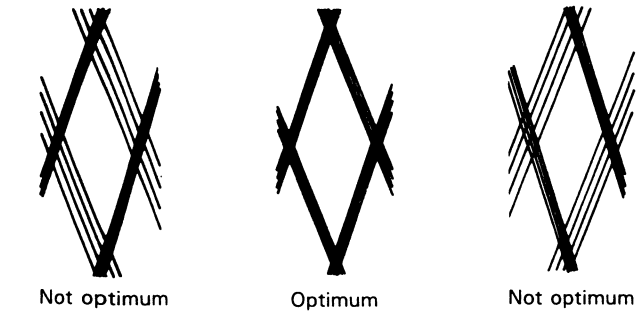


Fig. 9-4 Pickup Angle Adjustment

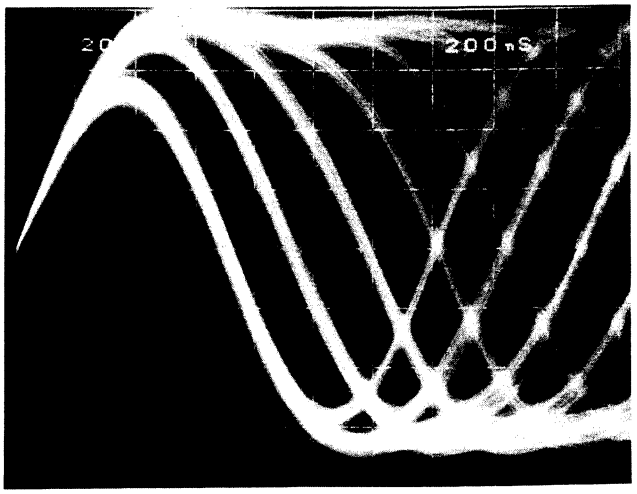


Photograph 9-9

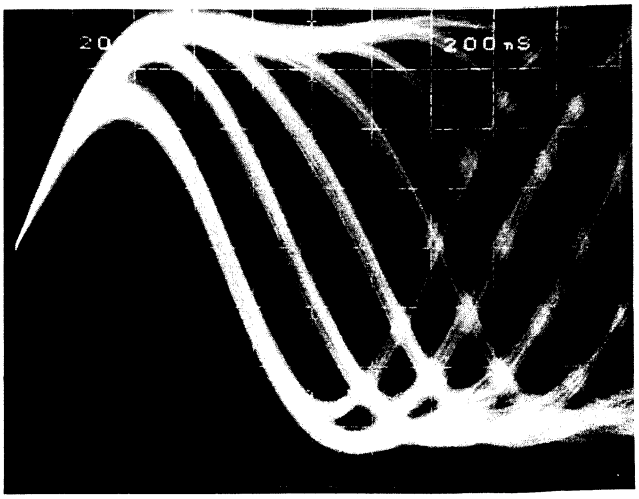




Photograph 9-8



Photograph 9-10



Photograph 9-11

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
7	**FOCUS GAIN ADJUSTMENT (WITHOUT USING AN FTG ADJUSTER)** *Note: If you have an FTG Adjuster, skip this step and see Page 81.*					
	50mV /div	0.5mS /div	AF Osc. output terminal	AF Osc. output control	880Hz 0.2Vp-p	• Connect oscilloscope to the output terminal of AF oscillator and adjust its output to 880Hz and 0.2Vp-p. (The AF oscillator output should be adjusted before the connection described below.) • Press TRACK FWD key, PLAY key and PAUSE key by turns to close all servos.
	CH-1 20mV /div CH-2 50mV /div	X-Y mode	CH-1 CN101 pin6 (FO.IN) and AF Osc. output CH-2 CN101 pin1 (FO.OT)	VR3 (FO.GA)	Symmetrical Lissajous figures	• Connect oscilloscope, AF oscillator and resistor to the player as shown in Fig. 9-5. Set oscilloscope to X-Y mode. • Adjust VR3 FO.GA (Focus Gain) so that the Lissajous figures become symmetrical. (see photograph 9-13)

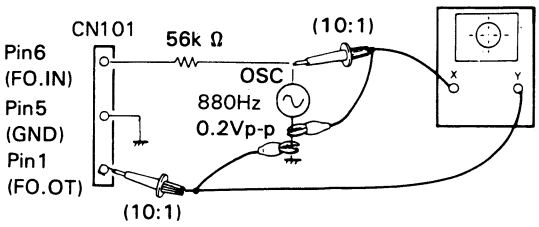
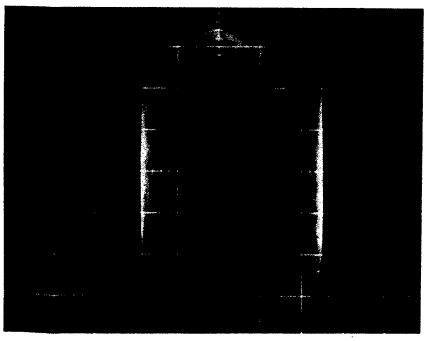
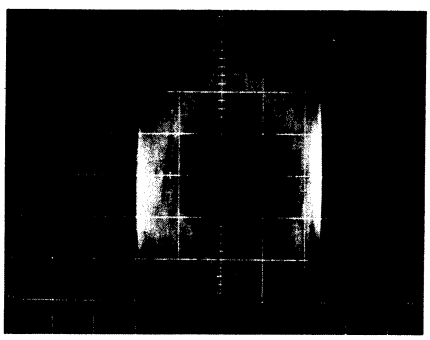


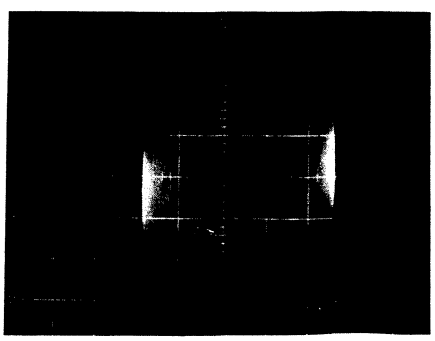
Fig. 9-5



Photograph 9-12
Low gain



Photograph 9-13
Optimum Gain



Photograph 9-14
High gain

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
8	**TRACKING GAIN ADJUSTMENT (WITHOUT USING AN FTG ADJUSTER)** *Note: If you have FTG Adjuster, skip this step and see Page 81.*					
	0.1V /div	0.5mS /div	AF Osc. output terminal	AF Osc. output control	1130Hz 0.4Vp-p	• Connect oscilloscope to the output terminal of AF oscillator and adjust its output to 1130Hz and 0.4Vp-p. (The oscillator output should be adjusted before the connection described below.) • Press the TRACK FWD key, PLAY key and PAUSE key by turns to close all servos.
	CH-1 50mV /div CH-2 50mV /div	X-Y mode	CH-1 CN101 pin7 (TR.IN) and AF Osc. output CH-2 CN101 pin2 (TR.OT)	VR4 (TR.GA)	Symmetrical Lissajous figures	• Connect oscilloscope, AF osillator and a resistor to the player as shown in Fig. 9-6. Set oscilloscope to X-Y mode. • Adjust VR4 TR.GA (Tracking Gain) so that the Lissajous figures become symmetrical (see photograph 9-16)

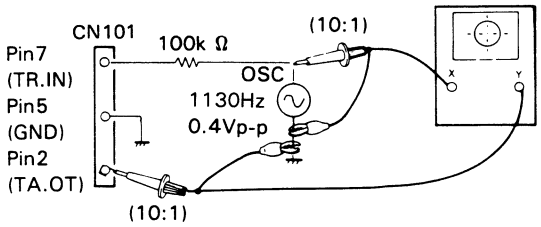
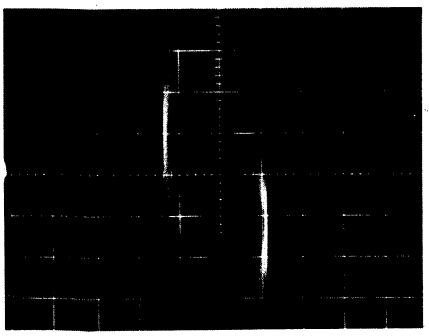
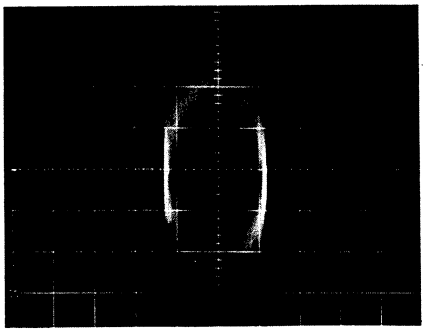


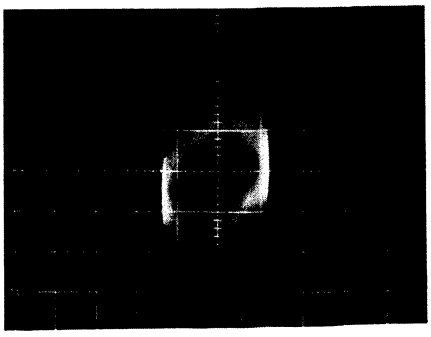
Fig 9-6



Photograph 9-15
Low gain

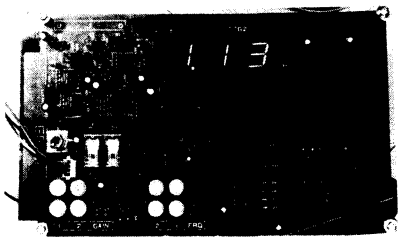


Photograph 9-16
Optimum Gain



Photograph 9-17
High gain

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
9	**FOCUS AND TRACKING GAIN ADJUSTMENT USING AN FTG ADJUSTER** *Note: If you have adjusted Focus and Tracking gains at step 7 and 8, skip this step and see Page 82.*					
						• Turn power switch of FTG adjuster on. The power switch is located on the right side of the adjuster. Turn the selector switch of the FTG adjuster to 1. The selector switch is located on the left side of the panel. • Connect oscilloscope to TP (Test Point) of FTG adjuster. The TP is located on the right side of selector switch.
				FREQ-1 Pots of FTG-adjuster		• Adjust two FREQ-1 potentiometers of the FTG adjuster so that the output frequency becomes 880Hz. The frequency is indicated by three 7-segment LEDs on the FTG adjuster.
	50mV /div	0.5mS /div	TP of FTG-adjuster	GAIN-1 Pots of FTG-adjuster		• Adjust two GAIN-1 potentiometers of the FTG adjuster so that the amplitude of the output signal becomes 0.2Vp-p. • Turn the selector switch of FTG adjuster to 2.
				FREQ-2 Pots of FTG-adjuster		• Adjust two FREQ-2 potentiometers of the FTG adjuster so that the output frequency becomes 1130Hz.
	0.1V /div	0.5mS /div	TP of FTG-adjuster	GAIN-2 Pots of FTG-adjsuter		• Adjust two GAIN-2 potentiometers of the FTG adjuster so that the amplitude of the output signal becomes 0.4Vp-p. • Turn the selector switch to the neutral position (center). • Connect orange wire of FTG adjuster to CN101 pin6 (FO.in) of the player, brown wire to CN101 pin1 (FO.OT), yellow wire to CN101 pin7 (TR.IN), red wire to CN101 pin2(TR.OT) and black wire to chassis. • Press the TRACK FWD key, PLAY key and PAUSE key by turns to close all servos.
				VR3 (FO.GA)	Green LED (JUST) on	• Turn the selector switch to 1. Adjust VR3 FO.GA (Focus Gain) so that a green LED (JUST) comes on.
				VR4 (TR.GA)	Green LED (JUST) on	• Turn the selector switch of FTG adjuster to 2. Adjust VR4 TR.GA (Tracking Gain) so that the green LED (JUST) comes on.



Photograph 9-18
FTG Adjuster

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
10	**VCO FREE-RUN FREQUENCY ADJUSTMENT**					
	0.5V /div	0.1μS /div	TP6 or D27 cathode, or one end of C31			• Connect oscilloscope to TP6 (VCO test pin) or D27 cathode, or to one end of C31 (see Fig. 9-7). • Press TRACK FWD key and PLAY key by turns to close the focus and spindle servos. • Turn AC-GND-DC switch of oscilloscope to DC.
					Waveform is positioned at the center	• Adjust vertical position of oscilloscope so that the waveform is positioned at the center. Note: It is not necessary to set the GND level at the center of the oscilloscope in this adjustment. Simply position the waveform at the center of the oscilloscope with the vertical position control.
						• Press PAUSE key to close the tracking servo.
				VL1	Waveform is positioned at the center	• Adjust VL1 (VCO coil) with a core driver so that the waveform is positioned at the center.
					DC level of the waveforms is not changed	• Open and close the tracking servo by depressing PAUSE key a few times and verify that the DC level of the waveforms is not changed.

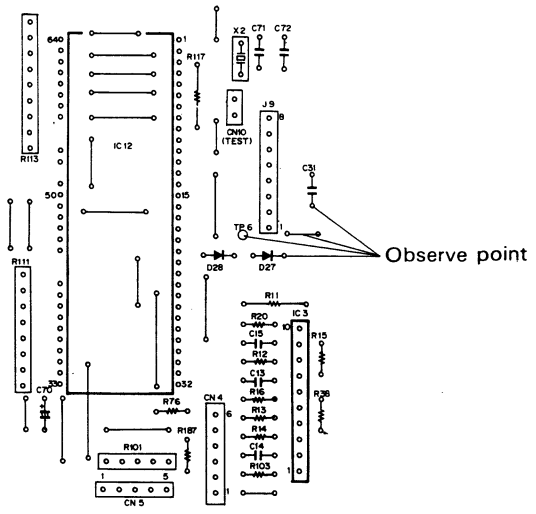


Fig. 9-7 Main board assembly

9. RÉGLAGE

• Points de réglage

1. Vérification de puissance de sortie de diode laser (LD)
2. Réglages de décalage d'alignement et de décalage de mise au point
3. Vérification de verrouillage de mise au point et d'axe
4. Réglage de quadrillage
5. Réglage d'équilibre d'alignement
6. Réglage tangentiel
7. Réglage de gain de mise au point
8. Réglage de gain d'alignement
9. Réglage de fréquence de fonctionnement libre VCO

• Equipements de mesure

1. Oscilloscope double tracé
2. Indicateur de puissance laser (LPM-8000)
3. Disque d'essai (YEDS-7)
4. Oscillateur AF
5. Tournevis de quadrillage (R-882)

• Mode d'essai

Tous les ajustements doivent être effectués en mode d'essai.

Procédures de mise en service et annulation du mode d'essai

(1)Pour passer en mode d'essai, allumer l'interrupteur d'alimentation (POWER) (S401) du lecteur en établissant un court-circuit entre les bornes TEST MODE.

(2)Pour annuler le mode d'essai, il suffit de ramener sur OFF l'interrupteur d'alimentation (POWER) du lecteur.

Les diverses fonctions des touches en mode d'essai sont reprises dans le Tableau 9-1.

• Points de réglage

VR2: Décalage d'alignement (TR.OF)
VR3: Gain de mise au point (FO.GA)
VR4: Gain d'alignement (TR.GA)
VR5: Equilibre d'alignement (TR.BL)
VR6: Décalage de mise au point (FO.OF)
VL1: Fréquence de fonctionnement libre VCO

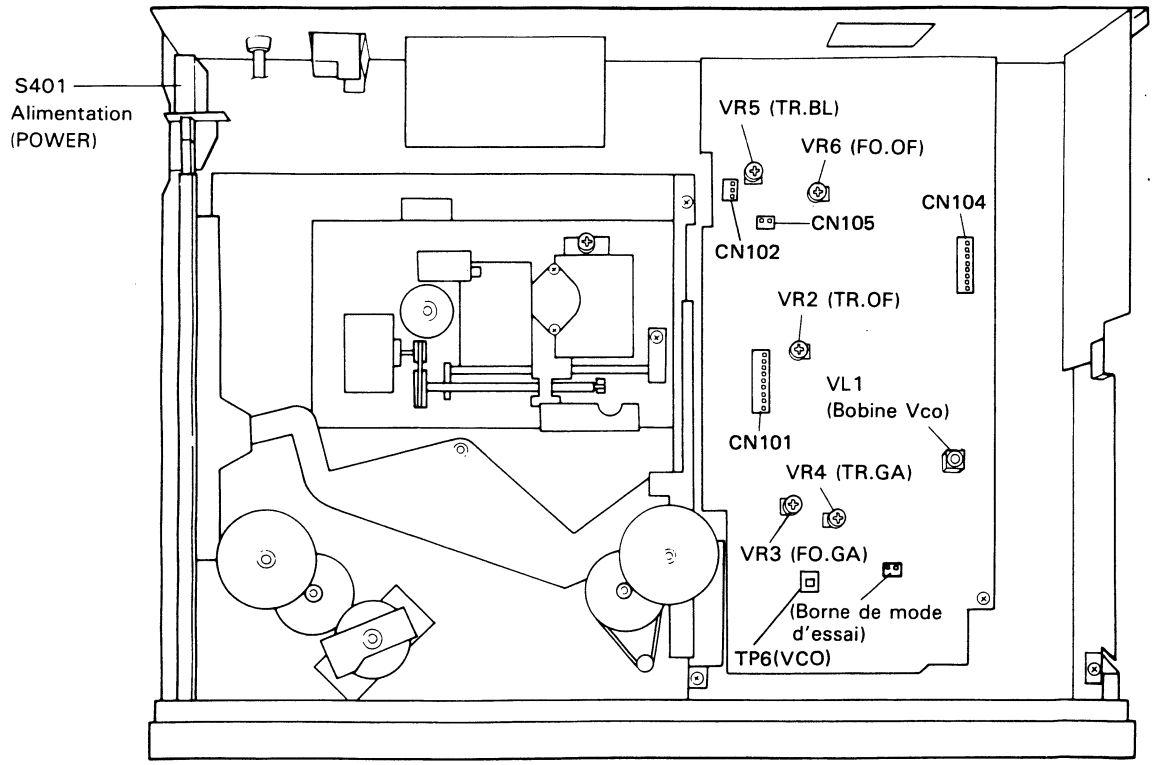
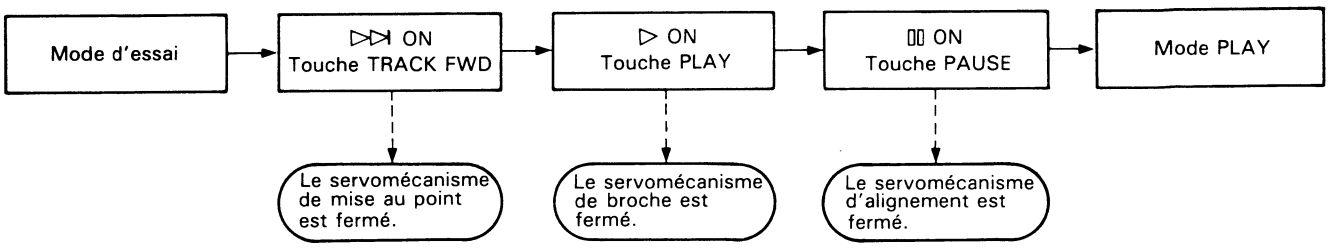


Fig. 9-1 Points de réglage

En mode d'essai, chaque servomécanisme peut être fermé et ouvert par des démarches distinctes. Part conséquent, chacun devra être fermé un à la fois (en séquence sérielle) pour passer au mode de lecture (PLAY).

Exemple: Passage du mode d'arrêt (STOP) au mode de lecture (PLAY).



- En mode d'essai, les servomécanismes fonctionnent en séquence sérielle.

Remarquer que le mode PLAY n'est pas actualisé par simple poussée sur la touche PAUSE en mode d'essai. Pendant la sélection ou le chargement d'un disque, ne pas tenter d'effectuer d'autres opérations.

- **Fonctions des touches en mode d'essai**

Symbole	Touche	Fonction en mode d'essai	Description
⊲⊲|	TRACK BACK	Diode laser allumée.	La diode laser s'allume.
|⊳⊳	TRACK FWD	Servomécanisme de mise au point fermé.	Le disque est logé depuis le magasin et immobilisé. La diode laser s'allume. L'actuateur se déplace à la verticale, puis le servomécanisme de mise au point est fermà.
▷	PLAY	Le servomécanisme d'axe est fermé.	L'axe commence à tourner et le servomécanisme est fermé quand la rotation atteint la vitesse optimale.
▯▯	PAUSE	Le servomécanisme d'alignement est fermé/ouvert.	Le servomécanisme est fermé en appuyant une fois sur la touche; le témoin PAUSE s'allume et le lecteur passe en mode PLAY tandis que la durée écoulée est indiquée sur l'affichage fluorescent. Les servomécanismes de mise au point et d'axe doivent être fermés à ce stade. Quand la touche est de nouveau actionnée, le servomécanisme d'alignement est ouvert.
⊲⊲	MANUAL SEARCH REV	Déplacement arrière du chariot (vers le centre du disque)	Le chariot est déplacé vers le centre du disque à vitesse rapide d'environ 1 cm/sec. Comme il n'existe pas de mécanisme de sécurité pour arrêter le chariot, relâcher la touche avant qu'il n'arrive à la fin du disque.
⊳⊳	MANUAL SEARCH FWD	Déplacement avant du chariot (vers le bord du disque)	Le chariot est déplacé vers la fin du disque à vitesse rapide d'environ 1 cm/sec. Comme il n'existe pas de mécanisme de sécurité pour arrêter le chariot, relâcher la touche avant qu'il n'arrive au bord du disque.
▭	REPEAT	Déplacement verticale (haut/bas) de l'objectif	Le disque est chargé depuis le magasin et immobilisé. La dlode laser s'allume. L'actuateur se déplace deux fois vers le haut et le bas, puis le disque est ramené dans le magasin. Le servomécanisme de mise au point n'est pas fermé.
□	STOP	STOP	Tous les servomécanismes sont ouverts.
⏏	EJECT	Le magasin est éjecté.	Le magasin ressort. Cependant, le capteur ne revient pas à la position de repos.
1-6	DISC 1-6 KEY	Sélection du disque	Un disque peut être choisi dans le système six-disques. Si la touche TRACK FWD ou REPEAT est actionnée sans sélection d'un disque, le lecteur choisit automatiquement le premier disque.
	HEURE	Tous les affichages fluorescents/à LED allumés	Vérification des circuits d'affichage

Tableau 9-1

REMARQUES:

1) Le réglage suivant doit être effectué en mode d'essai. Consulter la page 83 pour placer le lecteur en mode d'essai.
2) Le réglage suivant, sauf (1. Vérification de puissance de sortie de LD) doit être effectué avec un disque d'essai (YEDS-7).
   Placer le disque d'essai avec sa face enregistrée vers le haut dans un magasin et installer celui-ci dans le lecteur.
3) La description des réglages suivants commence à partir de l'état "STOP".

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos deprueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
1	**VERIFICATION DE PUISSANCE DE SORTIE DE DIODE LASER (LD)** *Remarque:* *Ce point peut être ignoré lors d'un entretien normal. On ne fera cette vérification que si la puissance semble faible ou si la diode laser semble défectueuse.*					
				VR1	0,26 mW ± 0,02 mW	Pour vérifier la puissance de sortie du laser, le capteur doit être retiré du châssis du mécanisme par les démarches suivantes. • Couper l'interrupteur d'alimentation. • Enlever la courroie A. • Déposer la fixation de barre de guidage. • Desserrer la vis de commande. • Soulever lentement l'ensemble du capteur en laissant le câble plat connecté. Prendre soin de ne pas établir un court-circuit entre la plaquette de circuit imprimé sur la capteur et le châssis. • Régler le lecteur en mode d'essai. • Placer le senseur de d'indicateur de puissance de laser (LPM-8000) sur l'objectif. • Appuyer sur la touche TRACK REV pour mettre le laser en service. • Vérifier que la puissance de sortie du laser respecte la plage spécifiée (0,26 ± 0,02 mW). Dans la négative, ajuster VR1 sur le capteur pour convenir à la spécification. • Couper l'interrupteur d'alimentation. • Réassembler les pièces déposées.
2	**REGLAGE DE DECALAGE D'ALIGNEMENT ET DE MISE AU POINT**					
	20mV /div	1 mS /div	CN101 broche 9 (TR.RT)	VR2 (TR.OF)	0V ± 10mV	• Raccorder un oscillateur ou un voltmètre sur CN101 broche 9 TR-RT (retour alignement). Ajuster VR2 TR.OF (décalage alignement) de sorte que la tension à la broche 9 de CN101 devienne 0V ± 10 mV.
	20 mV /div	1 mS /div	CN101 broche 3 (FO.ER)	VR6 (FO.OF)	0V ± 10 mV	• Raccorder un oscillateur ou un voltmètre sur la broche 3 de CN101 FO.ER (erreur de mise au point). Ajuster VR6 FO.OF (décalage de mise au point) de sorte que la tension à la broche 3 de CN101 devienne 0V ± 10 mV.

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos deprueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
3	**VERIFICATION DU VERROUILLAGE DE MISE AU POINT ET D'AXE**					
						• Appuyer sur la touche MANUAL SEARCH FWD pour amener le capteur vers le milieu du disque. Remarquer que cette démarche doit être accomplie.
	0,2 V /DIV	10 μS /DIV	Broche 1 CN105 (RF)		Un signal RF est produit.	• Raccorder l'oscilloscope à CN105 broche 1 RF (sortie RF) et vérifier que le signal haute fréquence est produit quand la touche TRACK FWD est actionnée (quand le servomécanisme de mise au point est fermé).
					Rotation anti-horaire	• Appuyer sur la touche PLAY et vérifier que le disque tourne à la vitesse optimale (environ 300 tr/mn au milieu de disque) dans le sens anti-horaire.
4	**REGLAGE DU QUADRILLAGE**					
						• Appuyer sur les touches TRACK FWD et PLAY pour fermer les servomécanismes de mise au point et d'axe (en laissant ouvert le servomécanisme d'alignement).
						• Raccorder l'oscilloscope sur CN101 broche 4 TR.ER (erreur d'alignement) par un L.R.F. de 4 kHz comme indiqué sur la Fig. 9-2.
	1V /DIV	10mS /div	CN101 broche 4 (TR.ER)	Quadrillage	Point NUL (enveloppe petite et douce	• Insérer le tournevis dans l'orifice de réglage du capteur comme indiqué à la Fig. 9-3. Le tourner lentement et trouver le point NUL. (Voir photo 9-1) Remarque: Si le capteur est levé par le tournevis pendant ce réglage, abaisser légèrement le capteur.
						• Tourner lentement le tournevis dans le sens des aiguilles à partir du point NUL et arrêter au point où la forme d'onde du signal d'erreur d'alignement atteint le maximum (voir photo 9-3)
	CH-1 50mV/div	mode X-Y	CH-1 CN102 broche 1 (BKTE)			• Raccorder l'oscilloscope CH-1 sur CN102 broche 1 (BKTE) et CH-2 à CN102 broche 2 (FWTE). Régler l'interrupteur AC-GND-DS de l'oscilloscope sur AC et le mode sur X-Y.
	CH-2 50mV/div Couplage CA		CH-2 CN102 broche 2 (FWTE)		Ligne droite de 45 degrés	• Tout en observant la figure Lissajous (voir photo 9-4), ajuster le quadrillage avec précision jusqu'au point où le Lissajous devient une ligne oblique p 45 degrés. (Voir photo 9-5).

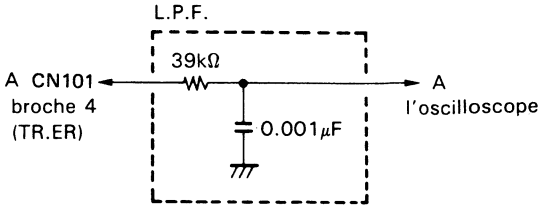


Fig. 9-2 4kHz L.P.F.

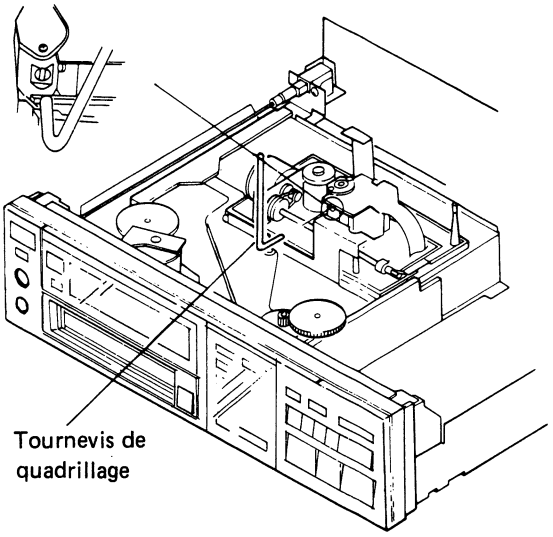


Fig. 9-3 Réglage de quadrillage

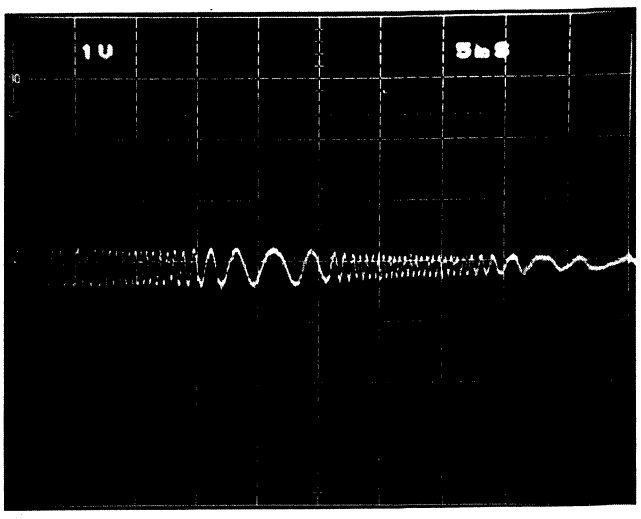


Photo 9-1
Enveloppe petite et douce (point NUL)

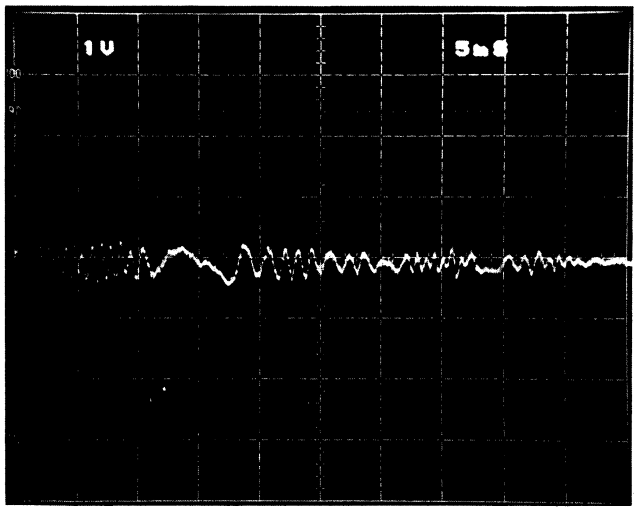


Photo 9-2
Enveloppe petite mais grossière (pas le point NUL)

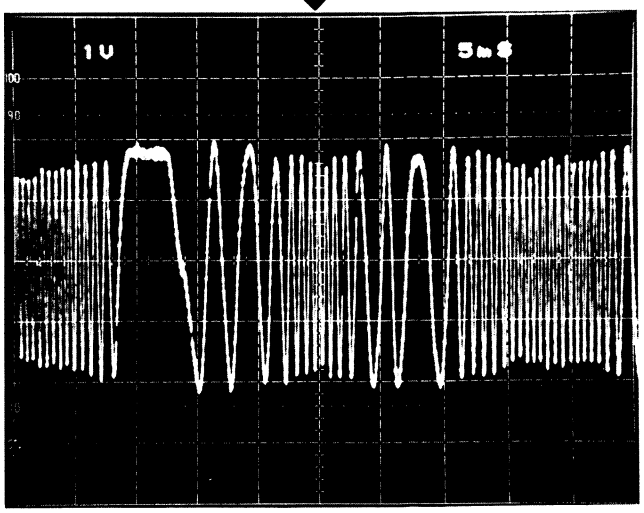


Photo 9-3 Amplitude maximum

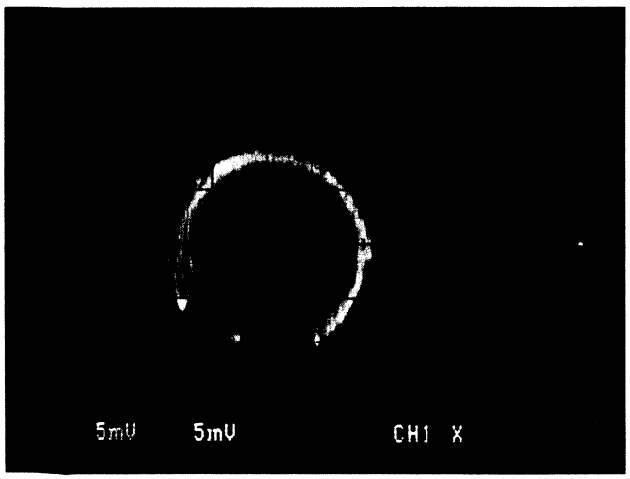


Photo 9-4 Figures Lissajous (avant réglage)

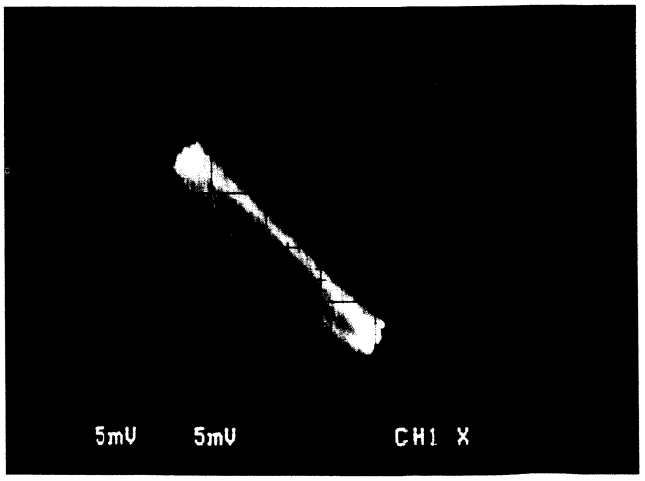
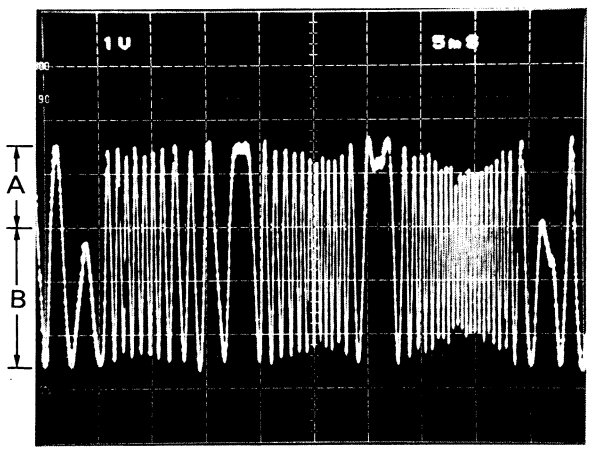
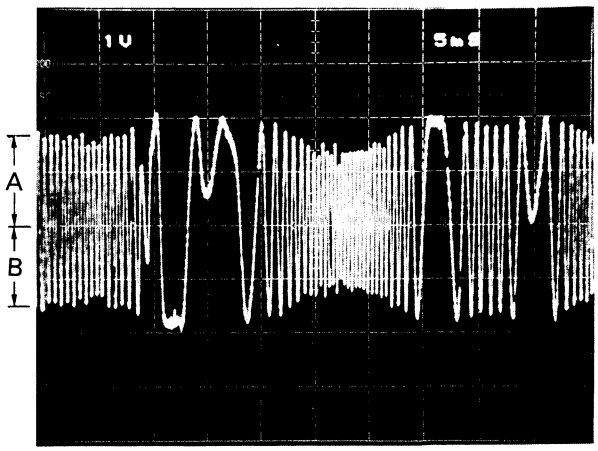


Photo 9-5 Figures Lissajous (après réglage)

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
5	**REGLAGE D'EQUILIBRE D'ALIGNEMENT**					
	1 V /div	10 mS /div	CN101 broche 4 (TR.ER)	VR5 (TR.BL)	Amplitude positive et négative égale (A = B)	• Appuyer sur la touche MANUAL SEARCH FWD pour déplacer la capteur près du milieu du disque. • Appuyer sur la touche TRACK FWD et PLAY pour lancer la ratation du disque. • Régler le niveau GND de l'oscilloscope au centre. • Raccorder l'oscilloscope à CN101 broche 4 TR.ER (erreur d'alignement) par un L.P.F. indiqué sur la Fig. 9-2. Ajuster VR5 TR.BL (equilibre d'alignement) de sorte que l'amplitude positive et négative de la forme d'onde soit égale, comme sur la photo 9-7.
	 Photo 9-6 A<B					 Photo 9-7 A = B
6	**REGLAGE PICK UP ANGLE**					
	0,2 V /DIV	0,2 μS /DIV	CN105 broche 1 (RF)	Pick up angle réglage tangentiel	Meilleur modèle de vue	• Appuyer sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes. (Le témoin PAUSE doit être allumé.) • Raccorder l'oscilloscope sur CN105 broche 1 RF (sortie haute fréquence) par une résistance de 10 k-ohms. Utiliser une résistance de 5 k-ohms si la forme d'onde n'est pas claire. • Ajuster la vis de réglage pick up pour obtenir le modèle le plus clair possible comme sur la photo 9-8. Le point de réglage optimal se trouve à mi-course entre les deux points à partie duquel le modèle commence à se détériorer quand la vis de réglage pick up est tournée dans le sens horaire ou anti-horaire.

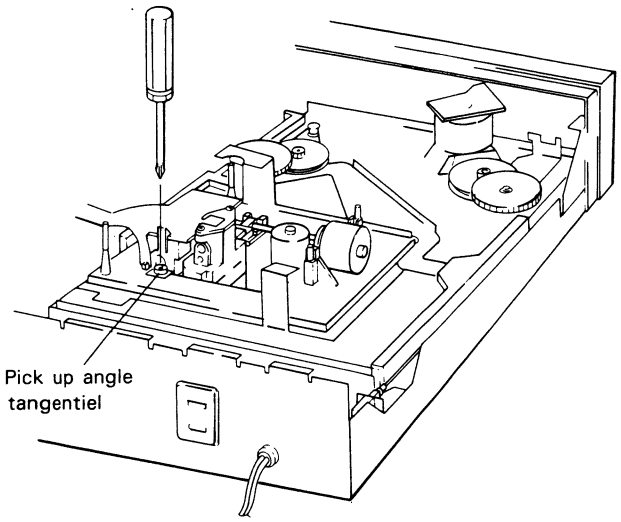


Fig. 9-4 Réglage pick up angle

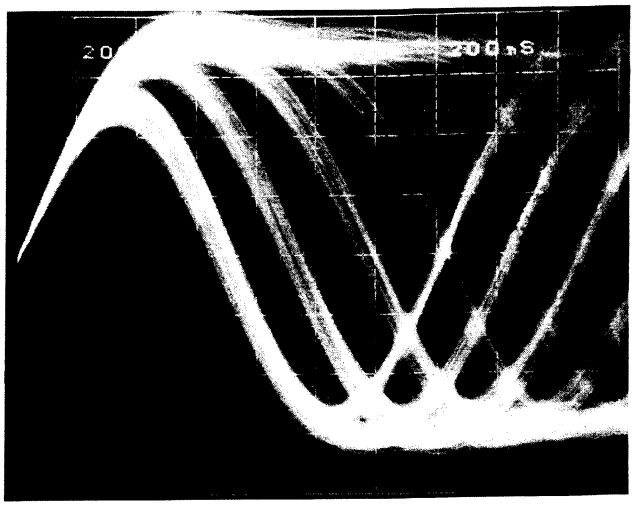
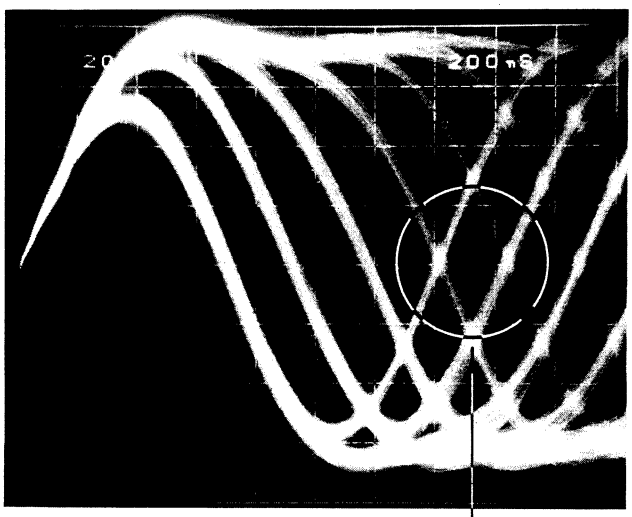


Photo 9-9



Partie à observer

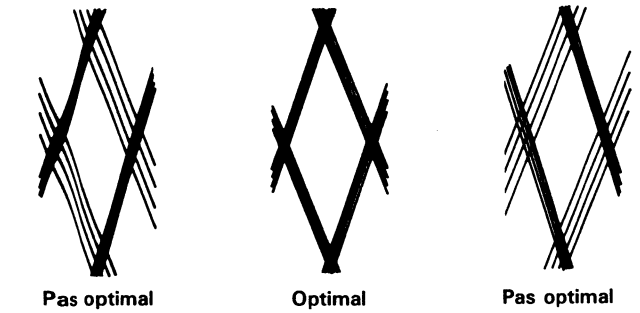


Photo 9-8

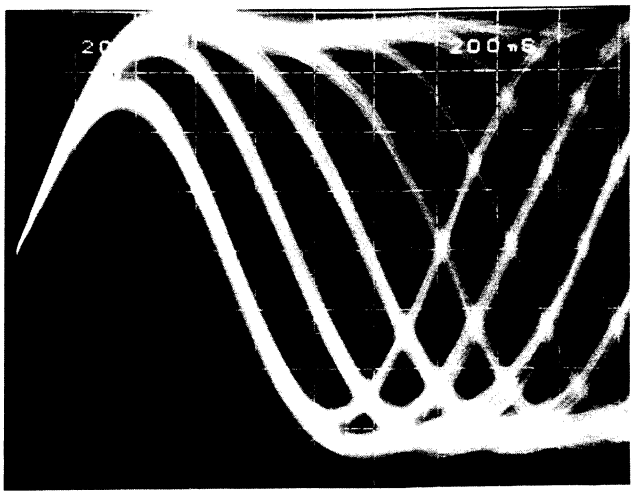


Photo 9-10

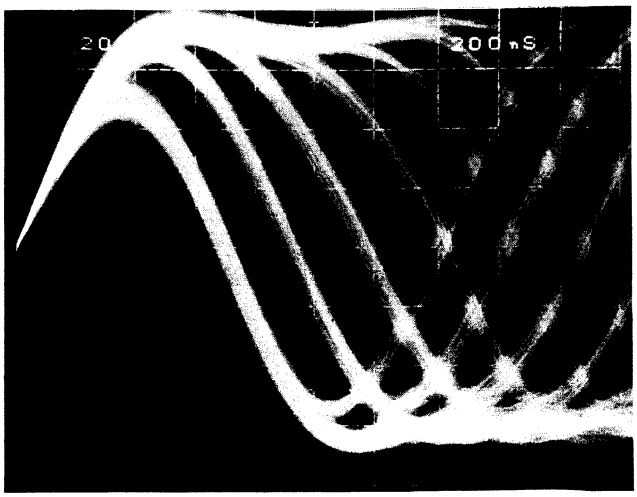


Photo 9-11

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
7	**REGLAGE DE GAIN DE MISE AU POINT (SANS UTILISATION D'UN AJUSTEUR FTG)** *Remarque: Si l'on a un ajusteur FTG, sauter cette démarche et passer en page* 92 .					
	50 mV /div	0,5 mS /div	Borne de sortie Osc. AF	Réglage de sortie Osc. AF	880Hz 0,2Vp-p	• Raccorder l'oscilloscope à la borne de sortie de l'oscilloscope AF et ajuster sa sortie à 880 Hz et 0,2 Vc-c. (La sortie d'oscillateur AF doit être ajustée avant la connexion décrite ci-après.) • Appuyer tour à tour sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes.
	Ch-1 20 mV /div CH-2 50 mV /div	Mode X-Y	CH-1 CN101 broche 6 (FO. IN et sortie Osc. AF) CH-2 CN101 broche 1 (FO.OT)	VR3 (FO.GA)	Figures Lissajous symétriques	• Raccorder l'oscilloscope, un oscillateur AF et une résistance au lecteur comme indiqué sur la Fig. 9-5. Régler l'oscilloscope en mode X-Y. • Ajuster VR3 FO.GA (gain de mise au point) de sorte que les figures Lissajous deviennent symétriques. (Voir photo 9-13)

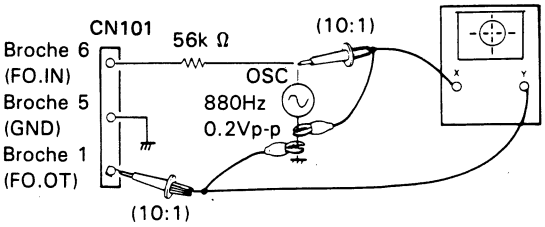


Fig. 9-5

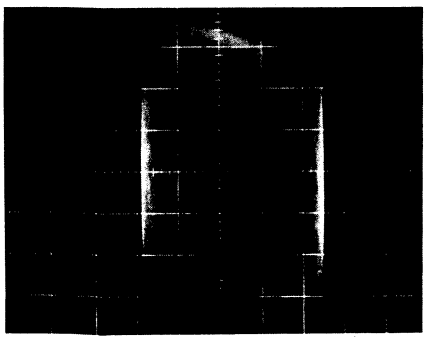


Photo 9-12 Gain faible

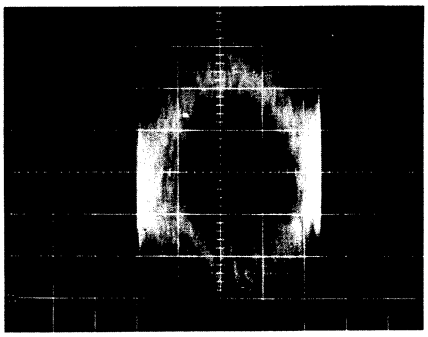


Photo 9-133 Gain optimal

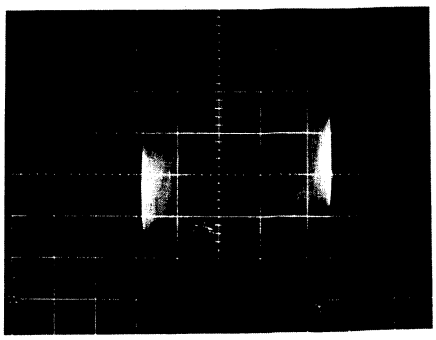


Photo 9-14 Gain élevé

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
8	**REGLAGE DE GAIN D'ALIGNEMENT (SANS UTILISATION D'UN AJUSTEUR FRG)** *Remarque: Si l'on a un ajusteur FTG, sauter cette démarche et voir en page* 92.					
	0,1V /div	0,5 mS /div	Borne de sortie Osc. AF	Réglage de sortie Osc. AF	1130Hz 0,4Vc-c	• Raccorder l'oscilloscope à la borne de sortie de l'oscillateur AF et ajuster sa sortie à 1130 Hz et 0,4 Vc-c. (La sortie d'oscillateur doit être ajustée avant la connexion décrite ci-après.) • Appuyer tour à tour sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes.
	CH-1 50mV /div CH-2 50mV /div	Mode X-Y	CH-1 CN101 broche 7 (TR.IN et sortie OSC. AF) CH-2 CN101 broche 2 (TR.OP)	VR4 (TR.GA)	Figures Lissajous symétriques	• Raccorder l'oscilloscope, l'oscillateur AF et une résistance au lecteur comme illustré sur la Fig. 9-6. Régler l'oscilloscope en mode X-Y. • Ajuster VR4 TR.GO (gain d'alignement de sorte que les figures Lissajous soient symétriques. (Voir photo 9-16)

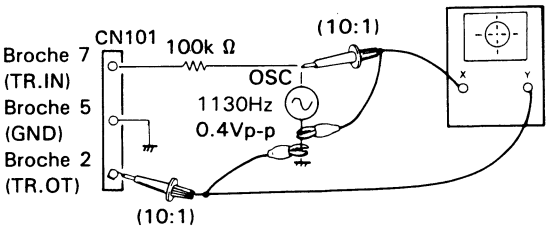


Fig. 9-6

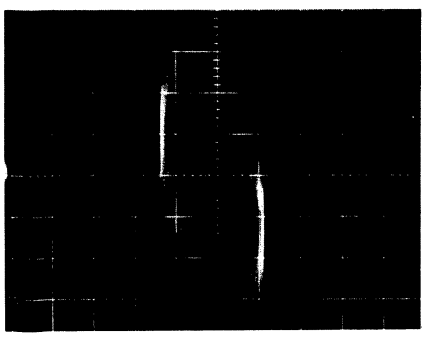


Photo 9-15 Gain faible

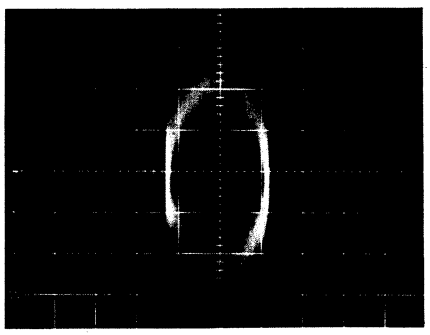


Photo 9-16 Gain optimal

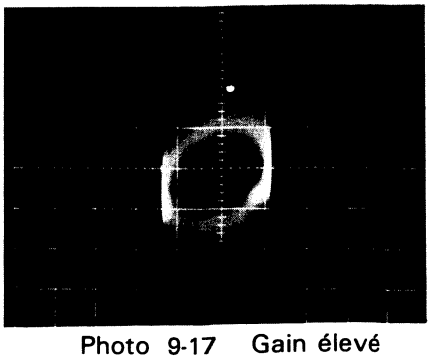


Photo 9-17 Gain élevé

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
9	**REGLAGE DE GAIN DE MISE AU POINT ET D'ALIGNEMENT AVEC UTILISATION D'UN AJUSTEUR FTG** *Remarque: Si l'on a ajusté les gains de mise au point et d'alignement aux démarches 7 et 8, ignorer cette étape et passer en page* 93.					
						• Allumer l'interrupteur POWER qui se trouve sur le flanc droit de l'ajusteur FTG. Tourner sur 1 le sélecteur de l'ajusteur FTG, situé sur le côté gauche du panneau.
						• Raccorder l'oscilloscope sur TP (point d'essai) de l'ajusteur FTG. Le point TP est situé sur le côté droit du sélecteur.
				Potentiomètres FREQ-1 d'ajusteur FTG		• Ajuster les potentiomètres FREQ-1 de l'ajusteur FTG de sorte que la fréquence de sortie devienne 880 Hz. La fréquence est indiquée par trois diodes LED à 7 segments sur l'ajusteur FTG.
	50 mV /div	0,5 mS /div	TP d'ajusteur TFG	Potentiomètres GAIN-1 d'ajusteur FTG		• Ajuster les 2 potentiomètres GAIN-1 de l'ajusteur FTG de sorte que l'amplitude du signal de sortie devienne 0.2 Vc-c.
						• Tourner sur 2 le sélecteur de l'ajusteur FTG.
				Potentiomètres FREQ-2 d'ajusteur FTG		• Ajuster les deux potentiomètres FREQ-2 de l'ajusteur FTG de sorte que la fréquence de sortie devienne 1130Hz.
	0,1V /div	0,5 mV /div	TP d'ajusteur FTG	Potentiomètres GAIN-2 d'ajusteur FTG		• Ajuster les deux potentiomètres GAIN-2 de l'ajusteur FTG de sorte que l'amplitude du signal de sortie devienne 0,4 Vc-c.
						• Tourner le Sélecteur à la position neutre (centre).
						• Raccorder le fil orange de l'ajusteur FTG sur **CN101** broche 6 (FO.IN) du lecteur, le fil brun sur **CN101** broche 1 (FO.OT), le fil jaune sur **CN101** broche 7 (TR.IN), le fil rouge sur CN101 broche 2 (TR.OT) et le fil noir au châssis. • Appuyer tour à tour sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes.
				VR3 (FO.GA)	Diode LED verte (JUST) allumée	• Tourner à 1 le Sélecteur. Ajuster VR3 FO.GAI (gain de mise au point) de sorte que s'allume la diode LED verte (JUST).
				VR4 (TR.GA)	Diode LED verte (JUST) allumée	• Tourner à le Sélecteur de l'ajusteur FTG. Ajuster VR4 TR.GO (gain d'alignement) de sorte que s'allume la diode LED verte (JUST).

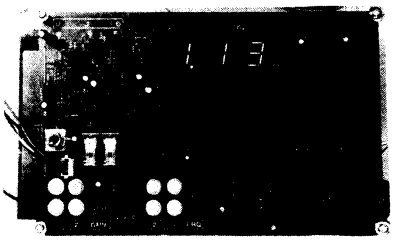


Photo 9-18 Ajusteur FTG

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procedimiento de ajuste
10	**REGLAGE DE FREQUENCE DE FONCTIONNEMENT LIBRE VCO**					
	0,5V /DIV	0,1 μS /DIV	TP6 ou cathode de D27 ou une extrémité de C31			• Connecter l'oscilloscope à TP6 (point test de VCO) ou à la cathode de D27 ou à une extrémité de C31. (voir Fig. 9-7). • Appuyer tour à tour sur les touches TRACK FWD et PLAY pour fermer les servomécanismes de mise au point et d'axe. • Tourner sur DC le sélecteur AC-GND-DC de l'oscilloscope. • Ajuster la position verticale de l'oscilloscope de sorte que la forme d'onde soit positionnée au centre. Remarque: Il n'est pas nécessaire de régler le niveau GND au centre de l'oscilloscope au cours de ce réglage. Positionner simplement la forme d'onde au centre de l'oscilloscope par le réglage de position verticale. • Appuyer sur la touche PAUSE pour fermer le servomécanisme d'alignement.
				VL1	Forme d'onde positionnée au centre Le niveau CC des formes d'onde n'est pas changé.	• Ajuster VL1 (bobine VCO) avec un tournevis de sorte que la forme d'onde soit positionnée au centre. • Ouvrir et fermer le servomécanisme d'alignement par quelques poussées sur la touche PAUSE et vérifier que le niveau DC des formes d'ondes n'est pas changé.

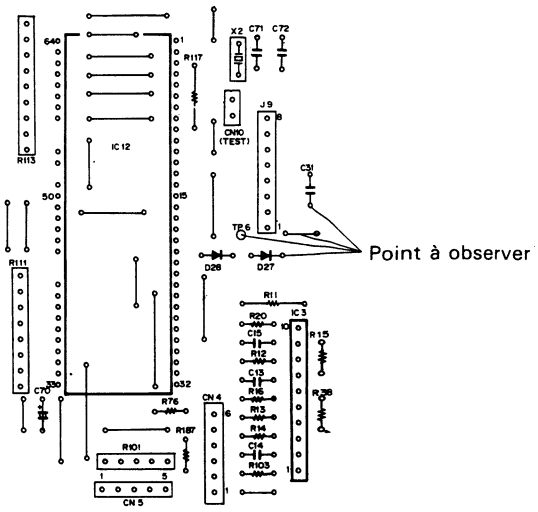


Fig. 9-7 Ensemble de plaquette Main

9. AJUSTE

- **Tipos de ajustes**

1. Verificación de la energía de salida del LD (diodo de láser)
2. Ajustes del descentramiento de seguimiento y del descentramiento del enfoque
3. Verificación de bloqueo del enfoque y de bloqueo del pivote
4. Ajuste de la rejilla
5. Ajuste de equilibrio de seguimiento
6. Ajuste tangencial
7. Ajuste de ganancia de enfoque
8. Ajuste de ganancia de seguimiento
9. Ajuste de la frecuencia de funcionamiento libre del VCO.

- **Equipos de medición**

1. Osciloscopio de trazado doble
2. Medidor de energía de láser (LPM-8000)
3. Disco de prueba (YEDS-7)
4. Oscilador de AF
5. Excitador de rejilla (R-882)

- **Mode de prueba**

Todos los ajustes deben efectuarse en el modo de prueba.

Ajuste del modo de prueba y procedimientos de cancelación

(1) Para ajustar el modo de prueba conecte (ON) el interruptor de alimentación (POWER) del reproductor (S401) cortocircuitando los terminales del mode de prueba (TEST MODE TERMINAL).
(2) Para cancelar el mode de prueba, desconecte (OFF) simplemente el interruptor de alimentación (POWER) del reproductor.

Las funciones de las diversas teclas en el modo de prueba se enumeran en la tala 9-1.

- **Puntos de ajuste**

VR2: Descentramiento de seguimiento (TR.OF)
VR3: Ganancia de enfoque (FO.GA)
VR4: Ganancia de seguimiento (TR.GA)
VR5: Equilibrio de seguimiento (TR.BL)
VR6: Descentramiento de enfoque (FO.OF)
VL1: Frecuencia de funcionamiento libre del VCO.

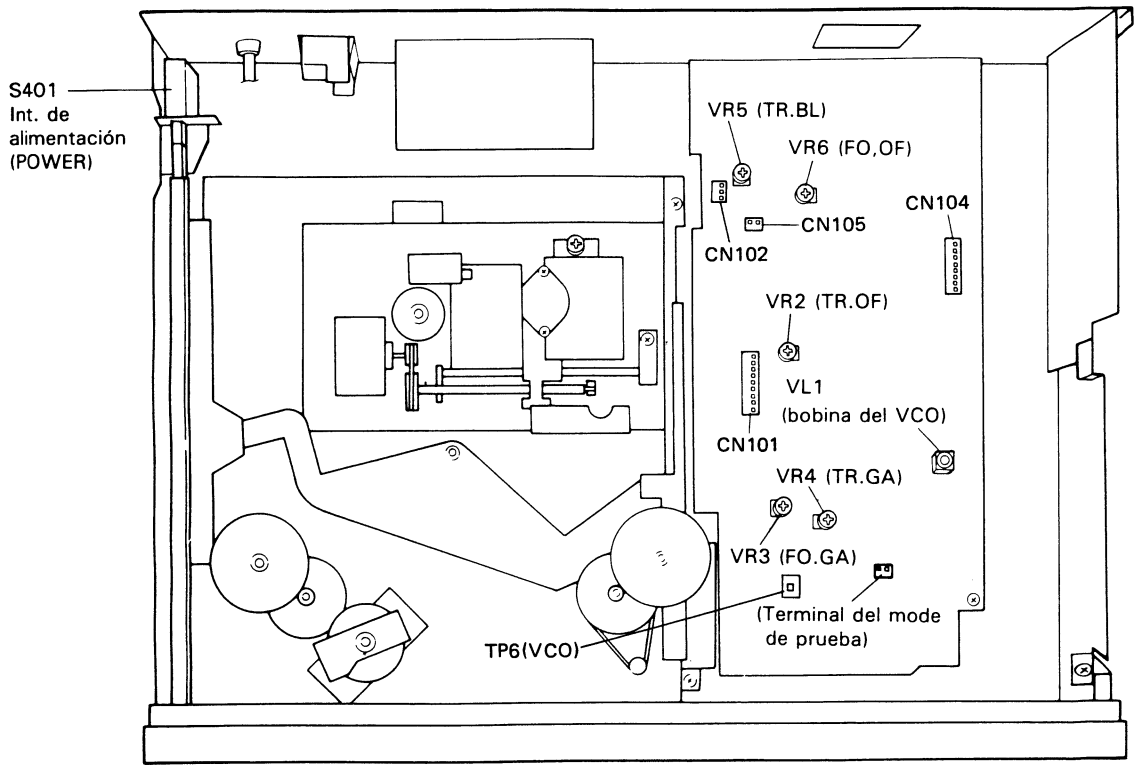
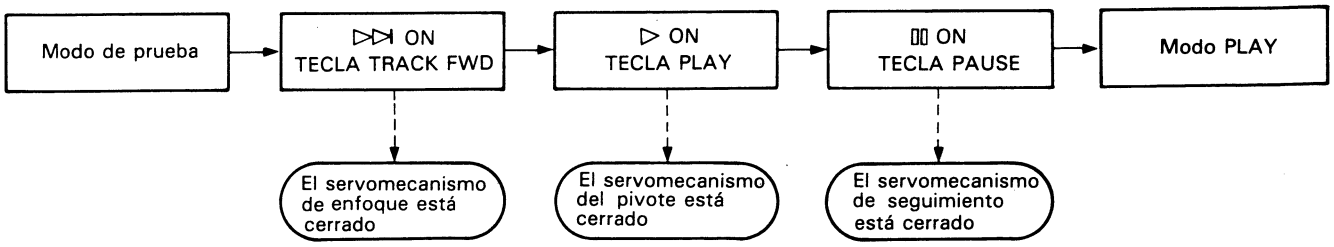


Fig. 9-1 Puntos de ajuste

En el modo de prueba, cada servocircuito puede cerrarse y abrirse mediante operaciones independientes. Consecuentemente, cada servocircuito debe estar cerrado en cierto momento (secuencia en serie) para establecer el modo de reproducción (PLAY).

Tenga presente que el modo de reproducción (PLAY) no se activa presionando simplemente la tecla de reproducción (PAUSE) en el modo de prueba.
Mientras se selecciona o carga un disco, no intente efectuar otras operaciones.

Ejemplo: Conmutación del modo del parada (STOP) al de reproducción (PLAY)



- Los servomecanismos operan en secuencia en serie durante el modo de prueba.

• Funciones de las teclas en el modo de prueba

Símbolo	Tecla	Función durante el modo de prueba	Descripción
⏮	TRACK BACK	Diodo láser activado (ON).	Se enciende el diodo láser.
⏭	TRACK FWD	El servomecanismo de enfoque está cerrado.	Se carga el disco desde el compartimiento y se enclava. Se enciende el diodo láser. El accionador se mueve hacia arriba y abajo y luego se cierra el servomecanismo de enfoque.
▷	PLAY	El servomecanismo del pivote está cerrado.	El pivote empieza a girar y el servomecanismo se cierra cuando las revoluciones alcanzan la velocidad óptima.
▯▯	PAUSE	El servomecanismo de seguimiento está cerrado/abierto.	El servomecanismo de seguimiento se cierra presionando una vez la tecla, se enciende el indicador de pausa (PAUSE) y el reproductor se establece en el modo de reproducción (PLAY) con el tiempo transcurrido indicado en el visualizador fluorescente. Los servomecanismo de enfoque y de pivote deben estar cerrados en este momento. Cuando se presiona de nuevo la tecla, se abre el servomecanismo de seguimiento.
◁◁	MANUAL SEARCH REV	El carro se mueve hacia atrás (hacia el centro del disco)	El carro se mueve hacia el centro del disco a rápida velocidad de aprox. 1 cm/s. Puesto que no hay mecanismo de seguridad para detener el carro, suelte la tecla cuando el carro llegue al final.
▷▷	MANUAL SEARCH FWD	El carro se mueve hacia adelante (hacia el extremo del disco)	El carro se mueve hacia el extremo del disco a rápida velocidad de aprox. 1 cm/s. Puesto que no hay mecanismo de seguridad para detener el carro, suelte la tecla cuando el carro llegue al final.
▭	REPEAT	El objetivo se mueve hacia arriba y abajo.	El disco se carga desde el compartimiento y se enclava. Se enciende el diodo láser. El accionador se mueve hacia arriba y abajo dos veces y el disco se repone en el compartimiento. El servomecanismo de enfoque no se cierra.
▯	STOP	Parada (STOP)	Se abren todos los servomecanismos.
⏏	EJECT	Sale expulsado el compartimiento..	El compartimiento sale expulsado. Sin embargo, el fonocaptor no retorna a la posición de reposo.
1-6	DISC 1-6 KEY	Se selecciona el disco	Puede seleccionarse un disco del sistema de seis discos. Si se presionan las teclas de avance de canciones (TRACK FWD) o de repetición (REPEAT) sin haber seleccionado un disco, el reproductor selecciona automáticamente el primer disco.
	TIEMPO	Todos los FL/LED encendidos	Comprobación del circuito de indicaciones

Tabla 9-1

NOTAS:
1) Los ajustes siguientes deben efectuarse en el modo de prueba. Consulte la página 94 para establecer el reproductor en el modo de prueba.
2) El ajuste siguiente, excepto [1. VERIFICACION DE LA ENERGIA DE SALIDA DEL DIODO LASER] debe efectuarse con un disco de prueba (YEDS-7). Ponga el disco de prueba grabado en la parte de arriba en el compartimiento e inserte el compartimiento en el reproductor.
3) La descripción de los ajustes siguientes empieza por "STOP".

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Items de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
1	**VERIFICACION DE LA ENERGIA DE SALIDA DEL DIODO DE LASER** *NOTE:* *Este item puede saltarse bajo el servicio normal. Debe verificarse sólo cuando la energía de láser parezca ser débil o cuando el diodo láser parezca estar defectuoso.*					
				VR1	0,26 mw ±0,02 mW	Para verificar la energía de salida de láser, debe sacarse el foocaptor del clasis del mecanismo en elprocedimiento siguiente. • Desconecte el interruptor de alimentación. • Libere la correa A. • Saque el retenedor de la barra guía. • Afloje el tornillo de fijación. • Levante lentamente el conjunto del fonocaptor al revés manteniendo el cable plano conectado. Tenga cuidado en no cortocircuitar la tajerta de circuito impreso del fonocaptor con el chasis. • Ajuste el reproductor al modo de prueba. • Ponga el sensor del medidor de energía de láser (LPM-8000) encima del objetivo. • Presione la tecla TRACK REV para activar el láser. • Verifique que la energía de salida de láser esté dentro del margen especificado (0,26 ±0,02 mW). Si no es así, ajuste VR1 del fonocaptor para satisfacer las especificaciones. • Desconecte el interruptor de alimentación. • Vuelva a montar las partes.
2	**AJUSTE DEL DESCENTRAMIENTO DE SEGUIMIENTI Y DESCENTRAMIENTO DE ENFOQUE**					
	20 mV /div	1 ms /div	Patilla 9 de CN101 (TR.RT)	VR2 (TR.OF)	0V ±10 mV	• Conecte el osciloscopio o voltímetro a la patilla 9 de CN101 TR.RT (retorno de seguimiento). Ajuste VR2 TR.OF (descentramiento de seguimiento) de modo que la tensión en la patilla 9 de CN101pase a ser de 0 V ±10mW.
	20 mV /div	1 ms /div	Patilla 3 de CN101 (FO.ER)	VR6 (FO.OF)	0V ±10 mV	• Conecte el osciloscopio o voltímetro a la patilla 3 de CN101 FO.ER (error de enfoque). Ajuste VR6 FO.OF (descentramiento de enfoque) de modo que la tensión en la patilla 3 de CN101 pase a ser de 0 V ±10 mW.

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
3	**VERIFICACION DE BLOQUEO DE ENFOQUE Y BLOQUEO DE PIVOTE**					
	0,2V /div	10 μs /div	Patilla 1 de CN105 (RF)		Se genera la señal de RF	• Presione la tecla MANUAL SEARCH FWD para mover el fonocaptor más cerca de la parte intermedia del disco. Tenga presente que este paso debe realizarse. • Conecte el osciloscopio a 1 apatilla 1 de CN105 RF (salida RF) y verifique que se genera la señal de RF cuando se presiona la tecla TRACK FWD (cuando se cierra el servomecanismo de enfoque).
					Rotación hacia la izquierda	• Presione la tecla PLAY y compruebe que gire el disco a la velocidad óptima (unas 300 rpm en la mitad del disco) en la dirección hacia la izquierda.
4	**AJUSTE DE LA REJILLA**					
	1V /div	10 ms /div	Patilla 4 de CN101 (TR.ER)	Rejilla	Punto NULL (envolvente pequeña y uniforme)	• Presione las teclas TRACK FWD y PLAY por turnos para cerrar los servomecanismos de enfoque y del pivote (dejando el servomecanismo de seguimiento abierto). • Conecte el osciloscopio a la patilla 4 de CN101 TR.ER (error de seguimiento) a través de L.P.F. de 4 kHz como se muestra en la Fig. 9-2. • Inserte el excitador de rejila en elorificio de ajuste del fonocaptor como se muestra en la Fig. 9-3. Gírelo lentamente y busque el punto nulo (NULL) (vea la fotografía 9-1) Nota: Si se levanta el fonocaptor con el excitador de rejilla durante el ajuste, retenga un poco bajado el fonocaptor.
					Amplitud máxima	• Gire el excitador de rejilla lentamente hacia la derecha desde el punto NULL y párelo en el punto en que la forma de onda de la señal de error de seguimiento llegue primero al punto máximo. (Vea la fotografía 9-3)
	Canal 1 50 mV/div Canal 2 50 mV/div Acoplamiento de CA	Modo X-Y	Canal 1 Patilla 1 de CN102 (BKTE) Canal 2 Patilla 2 de CN102 (FWTE)		Línea recta de 45 grados	• Conecte el canal 1 del osciloscopio a la patilla 1 de CN102 (BKTE) y el canal 2 a la patilla 2 de CN102(FWTE). Ajuste el interruptor AC-GND-DC del oscilloscopio a AC y el modo a X-Y. • Mientras observa el patrón de Lissajous (veala fotografía 9-4), ajuste con precisión la rejilla al punto en el que el patrón de Lissajous pase a ser una línea fina en 45 grados (vea la fotografía 9-5).

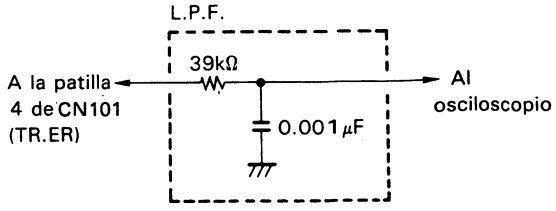


Fig. 9-2 L.P.F. de 4 kHz

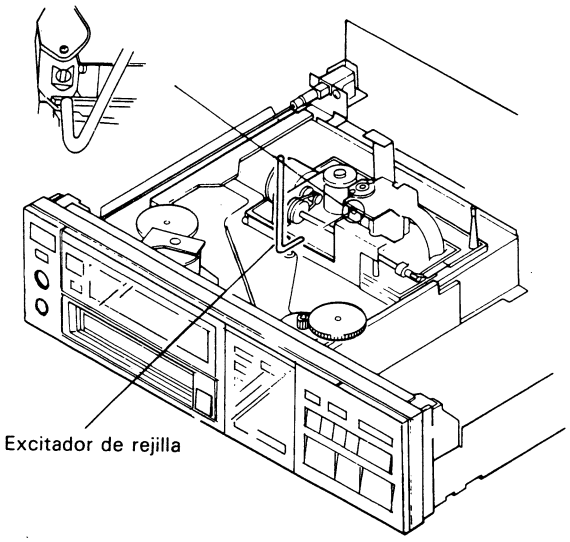
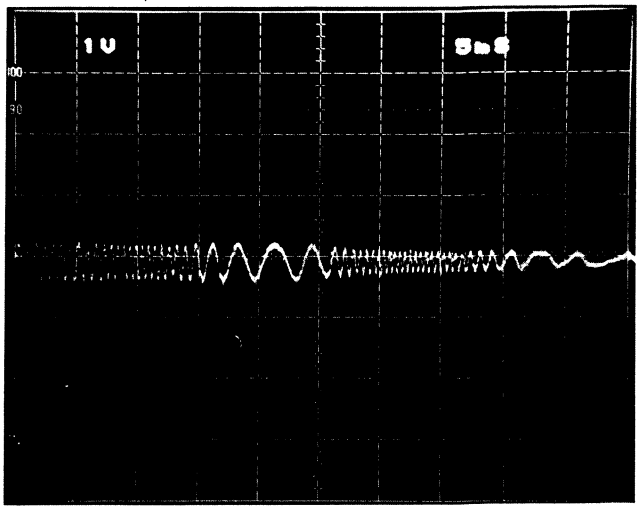
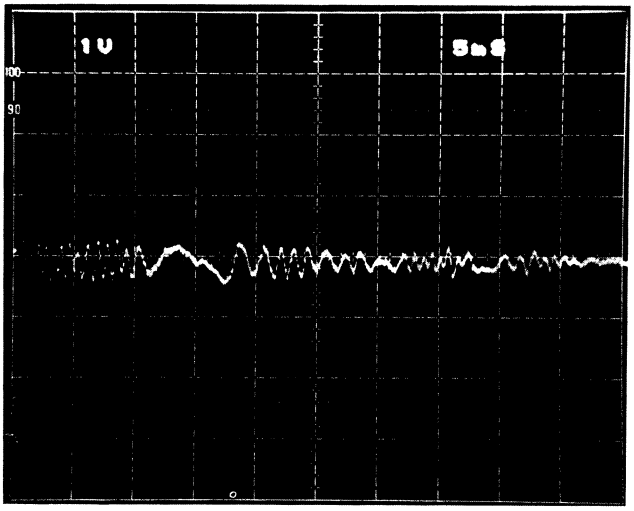


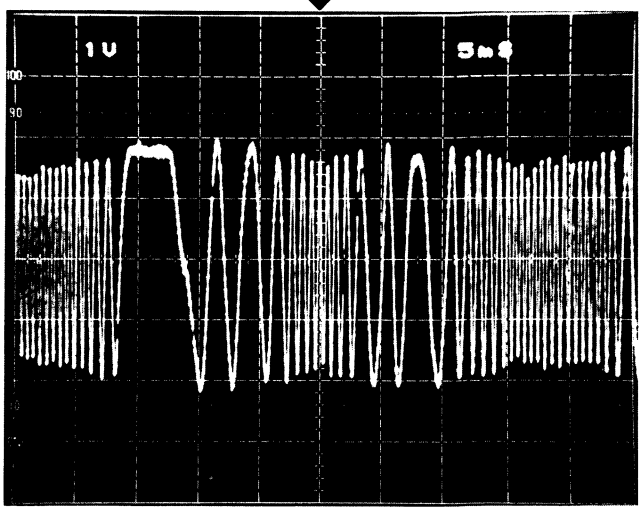
Fig. 9-3 Ajuste de la rejilla



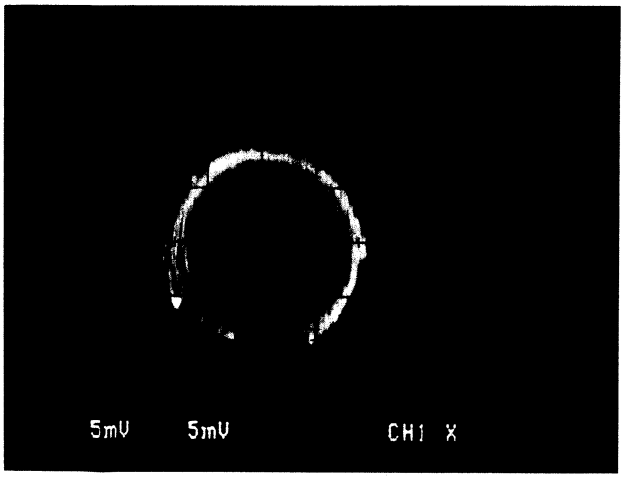
Fotografía 9-1
Envolvente pequeña y uniforme (punto NULL)



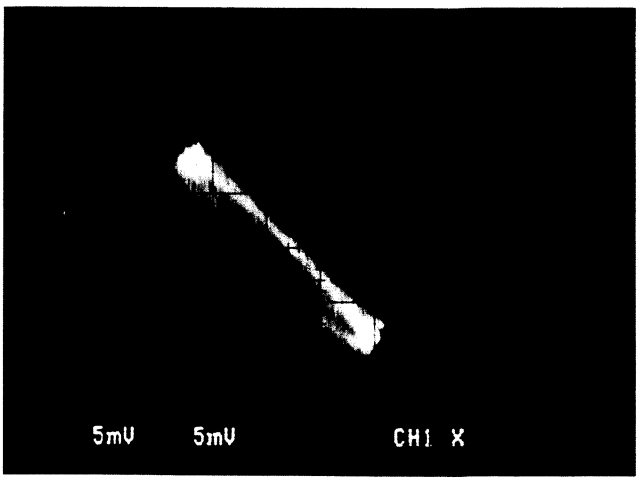
Fotografía 9-2
Envolvente pequeña pero gruesa (no el punto NULL)



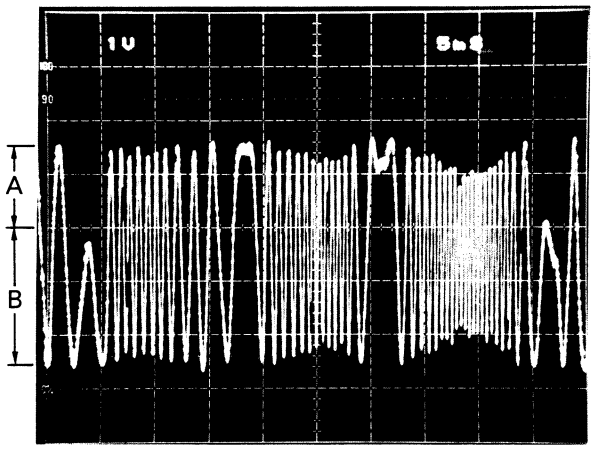
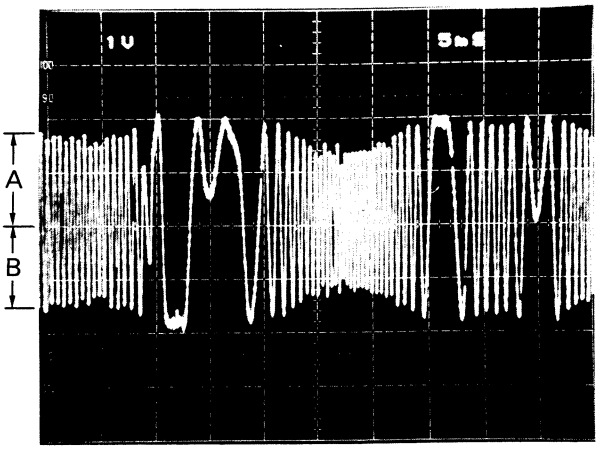
Fotografía 9-3
Amplitud máxima



Fotografía 9-4
Patrones de Lissajous (antes del ajuste)



Fotografía 9-5
Patrones de Lissajous (después del ajuste)

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
5	**AJUSTE DEL EQUILIBRIO DE SEGUIMIENTO**					
	1V /div	10 ms /div	Patilla 4 de CN101 (TR.ER)	VR5 (TB.BL)	Amplitud positiva y negativa iguales (A = B)	• Presione la tecla MANUAL SEARCH FWD para mover el fonocaptor más cerca de la parte intermedia del disco. • Presione las teclas TRACK FWD y PLAY por turnos para iniciar las vueltas del disco. • Ajuste el nivel de tierra (GND) del osciloscopio en el centro. • Conecte el osciloscopio a la patilla 4 de CN101 TR.ER (error de seguimiento) a través de L.P.F. mostrado en la Fig. 9-2. Ajuste VR5 TR.BL (equilibrio de seguimiento) de modo que la amplitud positiva y negativa de la forma de onda sean iguales que en la fotografía 9-7.
	 Fotografía 9-6 A < B					 Fotografía 9-7 A = B
6	**AJUSTE PICK UP ÁNGULO**					
	0,2V/div Acoplamiento de CA	0,2 μs /div	Patilla 1 de CN105 (RF)	pick up ángulo ajuste tangencial	Mejor patrón de vista	• Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los ervomecanismos. (El indicador PAUSE deberá encenderse.) • Conecte el osciloscopio a la patilla 1 de CN105 RF (salida de RF) a través de un resistor de 50 kohmios si la forma de onda no es clara. • Ajuste el tornillo de ajuste pick up ángulo para obtener el mejor patrón de vista como en la fotografía 8-8. El punto óptimo de ajuste está en un punto intermedio entre los dos puntos desde donde empieza a deteriorarse el patrón de vista cuando el tornillo de ajuste tangencial se gira hacia la derecha o hacia la izquierda. Tornillo de ajuste ángulo

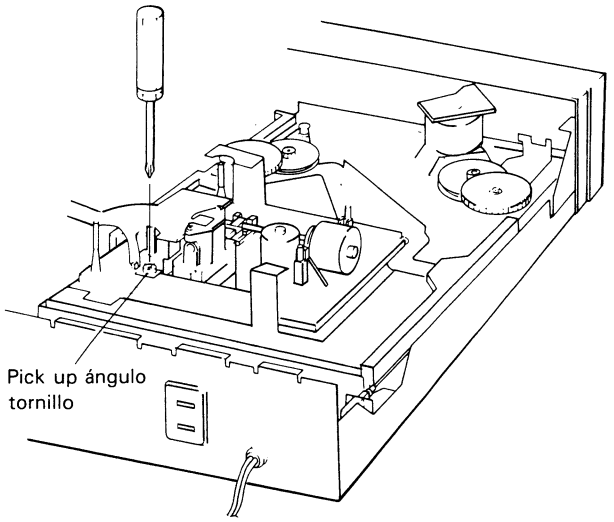
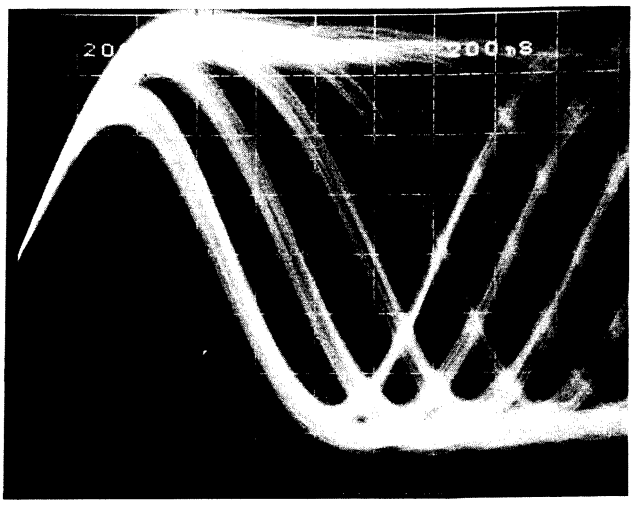
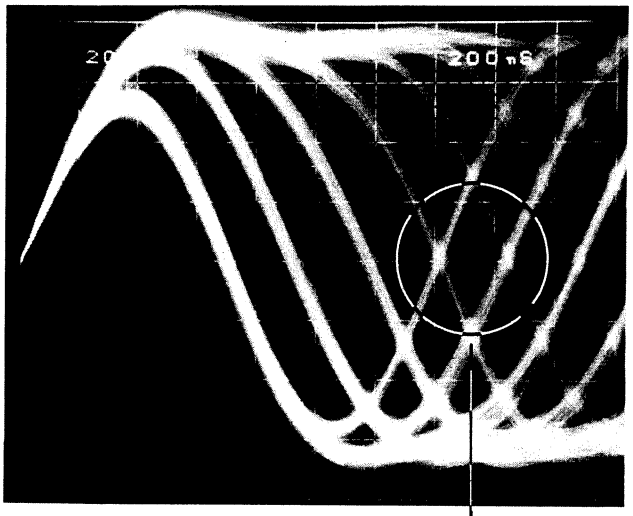


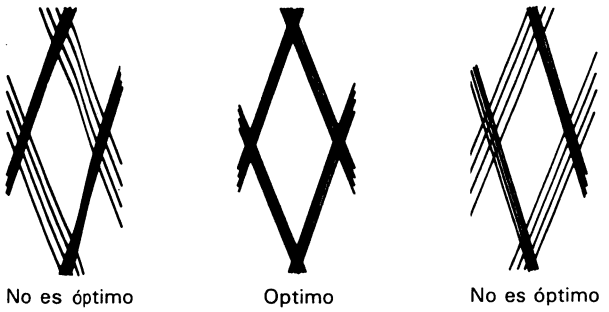
Fig. 9-4 Ajuste pick up ángulo



Fotografía 9-9

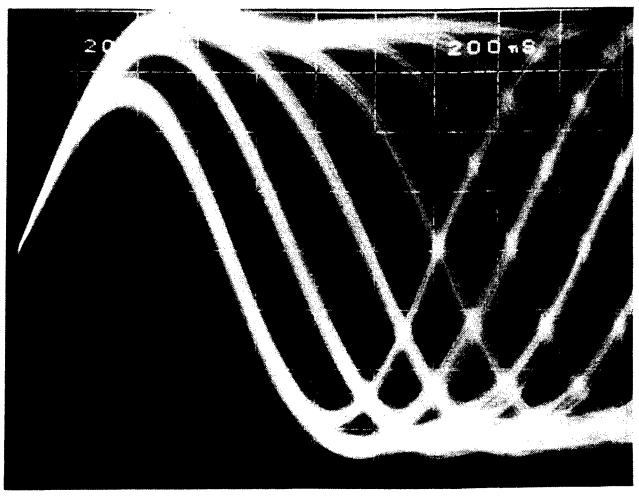


Parte a observarse

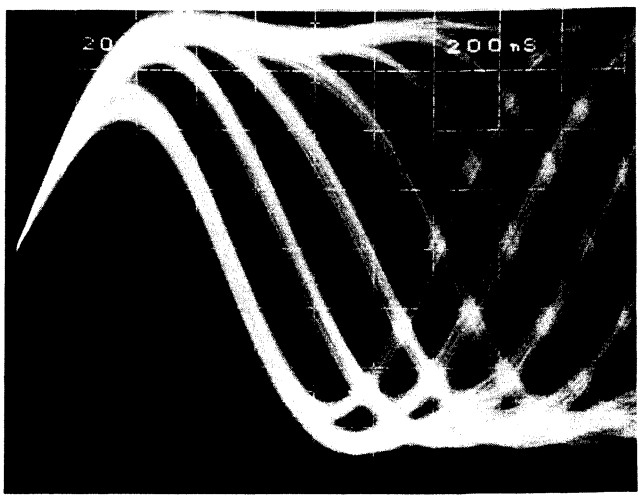


No es óptimo Optimo No es óptimo

Fotografía 9-8



Fotografía 9-10



Fotografía 9-11

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
7	**AJUSTE DE LA GANANCIA DE ENFOQUE (SIN EMPLEAR UN AJUSTADOR FTG)** *Nota: Si dispone de un ajustador FTG, salte este paso y consulte la página* 103.					
	50 mV /div	0,5 ms /div	Terminal de salida del osc. de AF	Control de salida del osc. de AF	880Hz 0,2Vp-p	• Conecte unosciloscopio al terminal de salida del oscilador de AF y ajuste su salida a 880 Hz y 0,2 Vp-p. (La salida del oscilador de AF debe ajustarse antes de la conexión descrita a continuación.) • Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los servomecanismos.
	Canal 1 20 mV /div Canal 2 50 mV /div	Modo X-Y	Canal 1 Patilla 6 de CN101 (FO.IN) y salida del osc. de AF Canal 2 Patilla 1 de CN101 (FO.OT)	VR3 (FO.GA)	Patrones de Lissajous simétricos	• Conecte el osciloscopio, oscilador de AF y un resistor al reproductor como se muestra en la Fig. 9-5. Ajuste el osciloscopo al modo X-Y. • Ajuste VR3 (FO.GA) (ganancia de enfoque) de modo que los patrones de Lissajous sean simétricos (vea la fotografía 9-13)

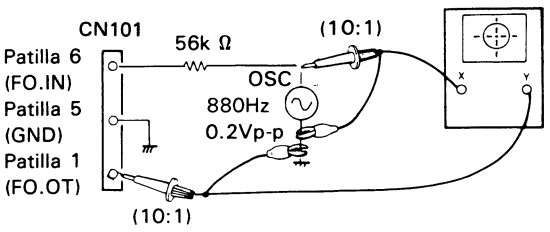
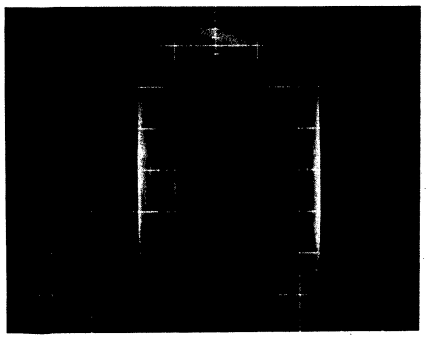
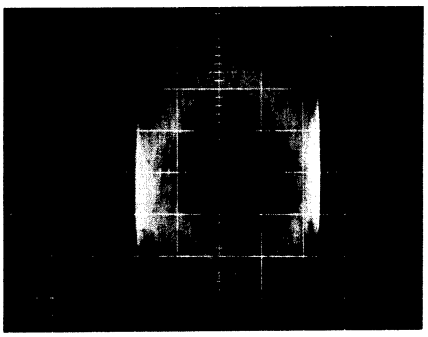


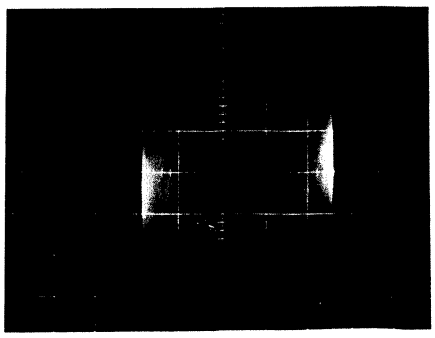
Fig. 9-5



Fotografía 9-12
Baja ganancia



Fotografía 9-13
Ganancia óptima



Fotografía 9-14
Alta ganancia

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
8	**AJUSTE DE LA GANANCIA DE SEGUIMIENTO (SIN EMPLEAR UN AJUSTADOR FTG)** *Nota: Si dispone de un ajustador FTG, salte este paso y consulte la página* 103.					
	0,1 V /div	0,5 ms /div	Terminal de salida del osc. de AF	Control de salida del osc. de AF	1130Hz 0.4Vp-p	• Conecte un osciloscopio al terminal de salida del oscilador de AF y ajuste su salida a 1130 Hz y 0,4 Vp-p. (La salida del oscilador de AF debe ajustarse antes de la conexión descrita a continuación.) • Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los servomecanismos.
	Canal 1 50 mV /div Canal 2 50 mV /div	Modo X-Y	Canal 1 Patilla 7 de CN101 (TR.IN) y salida del osc. de AF Canal 2 Patilla 2 de CN101 (TR.OT)	VR4 (TR.GA)	Patrones de Lissajous simétricos	• Conecte el osciloscopio, oscilador de AF y un resistor al reproductor como se muestra en la Fig. 9-6. Ajuste el osciloscopo al modo X-Y. • Ajuste VR4 TR.GA (ganancia de seguimiento) de modo que los patrones de Lissajous sean simétricos (vea la fotografía 9-16) .

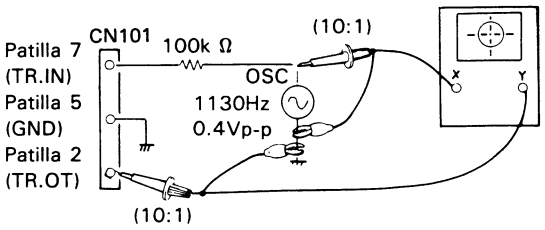
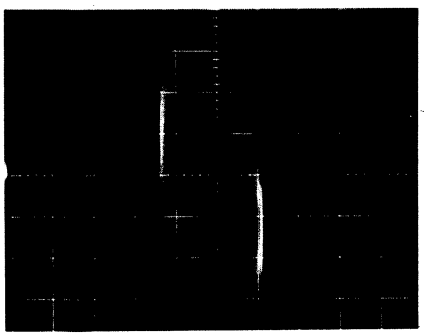
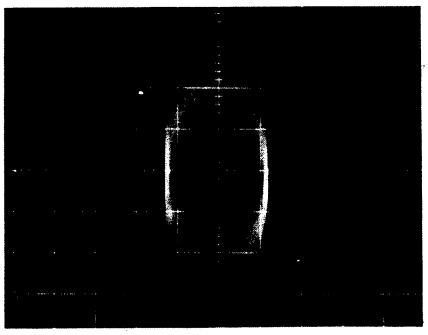


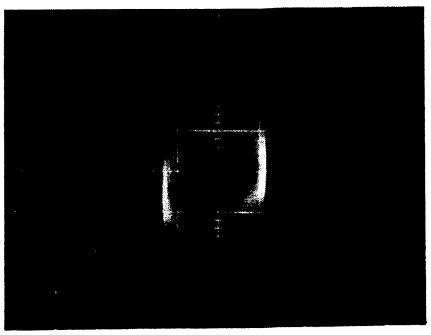
Fig. 9-6



Fotografía 9-15
Baja ganancia

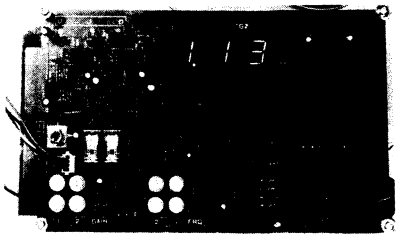


Fotografía 9-16
Ganancia óptima



Fotografía 9-17
Alta ganancia

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
9	**AJUSTE DE LA GANANCIA DE ENFOQUE Y DE SEGUIMIENTO EMPLEANDO UN AJUSTADOR FTG** *Nota: Si usted ha ajustado las ganancias de enque y seguimiento en los pasos 7 y 8, sale este paso y vea la página* 104.					
						• Conecte el interruptor de alimentación del ajustador FTG. EL interruptor está situado a la derecha del ajustador. Gire el selector del ajustador FTG a 1. El selector está situado a la izquierda del panel.
						• Conecte el osciloscopio a TP (punto de prueba) del ajustador FTG. El TP está situado a la derecha del selector.
				Potenc. de FREQ-1 del ajustador FTG		• Ajuste dos potenciómetros de FREQ-1 del ajustador FTG de modo que la frecuencia de salida pase a ser de 880 Hz. La frecuencia se indica con LEDs de 7 segmentos en el ajustador FTG.
	50 mV /div	0,5 ms /div	TP del ajustador FTG	Potenc. de GAIN-1 del ajustador FTG		• Ajuste dos potenciómetros de GAIN-1 del ajustador FTG de modo que la amplitud de la señal de salida sea de 0,2 Vp-p.
						• Gire el Selector del ajustador FTG a 2.
				Potenc. de FREQ-2 del ajustador FTG		• Ajuste dos potenciómetros de FREQ-2 del ajustador FTG de modo que la frecuencia de salida pase a ser de 1130 Hz.
	0,1 V /div	0,5 ms /div	TP del ajustador FTG	Potenc. de GAIN-2 del ajustador FTG		• Ajuste dos potenciómetros de GAIN-2 del ajustador FTG de modo que la amplitud de la señal de salida sea de 0,4 Vp-p.
						• Gire el Selector a la posición neutra (centro).
						• Conecte el conductor naranja del ajustador FTG a la patilla 6 de CN101(FO.IN) del reproductor, el conductor marrón a la patilla 1 de CN101(FO.OT), el conductor amarillo a la patilla 7 de CN101 (TR.IN), el conductor rojo a la patilla 2 de CN101(TR.OT), y el conductor negro al chasis.
						• Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los servocircuitos.
				VR3 (FO.GA)	LED verde (JUST) encendido	• Gire el Selector a 1. Ajuste VR3 FO.GA (ganancia de enfoque) de modo que se encienda un LED verde (JUST).
				VR4 (TR.GA)	LED verde (JUST) encendido	• Gire el Selector del ajustador FTG a 2. Ajuste VR4 TR.GA (ganancia de seguimiento) de modo que se encienda el LED verde (JUST).



Fotografía 9-18 Ajustador FTG

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procédure de réglage
10	**AJUSTE DE LA FRECUENCIA DE FUNCIONAMIENTO LIBRE DE VCO**					
	0,5 V /div	0,1 μs /div	Cátodo del TP6 o D27, o un extremo del C31			• Conectar el osciloscopio al cátodo del TP6 o D27, o a un extremo del C31 (ver Fig. 9-7).
						• Presione las teclas TRACK FWD y PLAY por turnos para cerrar los servocircuitos de enfoque y del pivote.
						• Gire el selector AC-GND-DC del osciloscopio a DC.
					La forma de onda se sitúa en el centro	• Ajuste la posición vertical del osciloscopio de modo que la forma de onda quede situada en el centro. Nota: No es necesario ajustar el nivel de GND en el centro del osciloscopio en este ajuste. Sitúe simplemente la forma de onda en el centro del osciloscopio con el control de posición vertical.
						• Presione la tecla PAUSE para cerrar el servomecanismo de seguimiento.
				VL1	La forma de onda se sitúa en el centro	• Ajuste VL1 (bobina de VCO) con un excitador de núcleo de modo que la forma de onda quede situada en el centro.
					El nivel de CC de las formas de ondas no cambia	• Abra y cierre el servomecanismo de seguimiento presionando la tecla PAUSE algunas veces y verifique que el nivel de CC de las formas de ondas no haya cambiado.

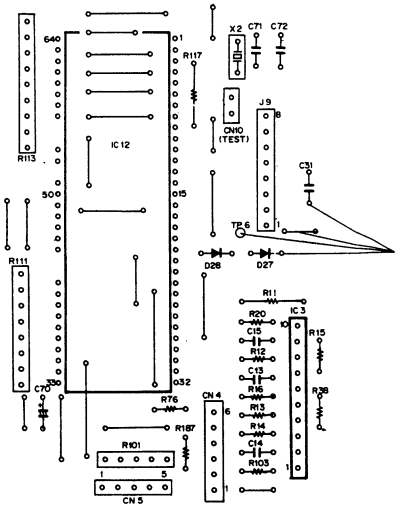


Fig. 9-7 Conjunto del tablero de Main